



AI
IoT
Advanced Control
Edge Computing

ECS-SRIA workshop
18/05/2021

*Marco Ceccarelli
DG CONNECT
European Commission*

EC ambition



*“In the global race for technological power, **Europe will lead if we seize the opportunities of data, microelectronics and connectivity...***

*Without an **autonomous European capacity on microelectronics**, there will be no European digital sovereignty.”*

*“By 2025, 80% of data will be **generated and processed at the Edge...***

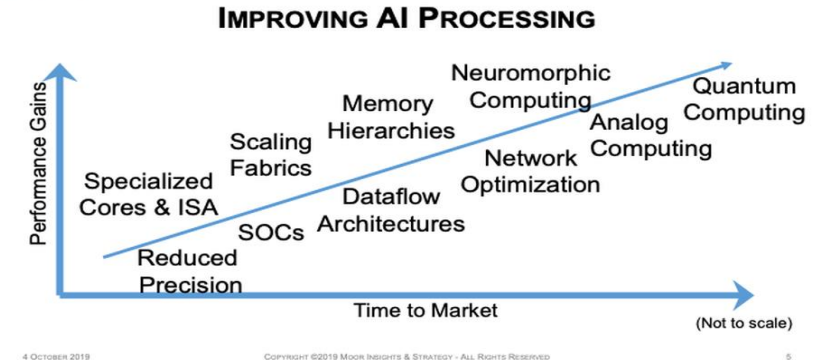
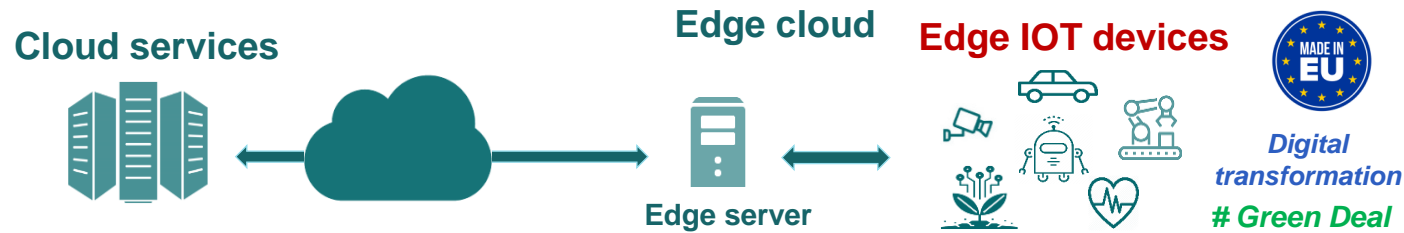
*The vast majority of data will not be created by us humans, but by objects and machines – the **Internet of Things.***

*...this is a **huge potential source of growth** for Europe, which has the largest industrial market in the world, with leading players, particularly in the 4.0 industry”*

Thierry Breton – EC Commissioner for Internal Market

AI, IoT, edge – trends and opportunities

MOR
INSIGHTS & STRATEGY



• Edge computing:

- EU strengths in embedded, low-power, real-time => **Edge computing** is top strategic priority
- Domain-specific architectures for best performance/power – Multifunctional integration (connectivity, sensing) - Invest in modular designs (chiplets), 3D/ heterogeneous integration
- IoT exponential growth, with 5G/6G / heterogeneous networks, getting smarter (AIoT)

• Proliferation of **AI**:

- Fastest growing HW segment (40-80% CAGR), capturing 50% of system value; ML+ inference
- EU has competences but lagging behind, must act fast to capture window of opportunity

• **HW/SW** co-design - domain-specific software and algorithms

• Architecture: **ARM** solid for RT/HPC, **RISC-V** gaining ground from IoT, offering flexibility

• New computation models – in-memory, analog, neuromorphic, photonics, quantum

Digital Design & IP

- EU must reduce vulnerabilities in **digital** domain, by developing **IP** and design capabilities:
 - **Grow competences** where EU is strong (automotive, industrial) with leadership ambitions (e.g. autonomous driving chips)
 - **Address opportunities** where EU has strong potential and critical gaps - communications, edge computing/ AI, data infrastructure; ultra-low power, accelerators, photonics...
 - Establish a **common EU IP platform** for open-source ecosystem (RISC-V cores, extensions, transversal elements, verification tools, interfaces, libraries, EDA)

Vertical	Entry-level	Mid-range	High-end / AI
Automotive	Embedded controllers, ultra-low power	Real-time / safety-critical: Vision, motion control, engine management, safety, infotainment	ADAS/autonomous driving processors, sensor fusion
Industrial automation	Embedded controllers: ultra-low power, smart sensing	Embedded processors, sensor fusion; edge-cloud management	High-performance processors with AI acceleration, edge server processors
Communication	Baseband connectivity for wireless communication 5G/6G	Edge server processors, 5G/6G private networks, RF mgmt	5G/6G Base station front-end processors, V-RAN
Data infrastructure		Edge AI node processor	Processors for edge/fog servers; CPUs and accelerators (servers, HPC)
Other (Healthcare, CE, Defence, Aerospace...)	Embedded controllers in wearables and healthcare devices	Embedded processors	High-end Processors, AI

Industrial Strategy



- Update 2021 - EC analysis of **strategic dependencies** shows challenges in advanced technologies such as **microelectronics**, cloud and **edge** computing
 - Recommendation: reinforce **processors** and semiconductor technology for data processing, communication and related data infrastructure, and new applications of **AI**
- **Toolbox** to reduce and prevent strategic dependencies:
 - EU **Alliance** on processors and semiconductor technologies
 - Pursue international **partnerships**
 - Instruments: IPCEI, RRF, InvestEU, Pact for Skills
- **Digital Compass** - objectives for EU's digital decade (by 2030):
 - 20% of world production of energy-efficient (10x) **processors** - Main R&I instrument: **KDT JU**, coordination through European alliance
 - 10,000 climate-neutral, highly secure, low-latency **edge nodes**

EC Member States Declaration on Processors and semiconductor technologies



December 2020, signed so far by **21 Member States** who agreed to:

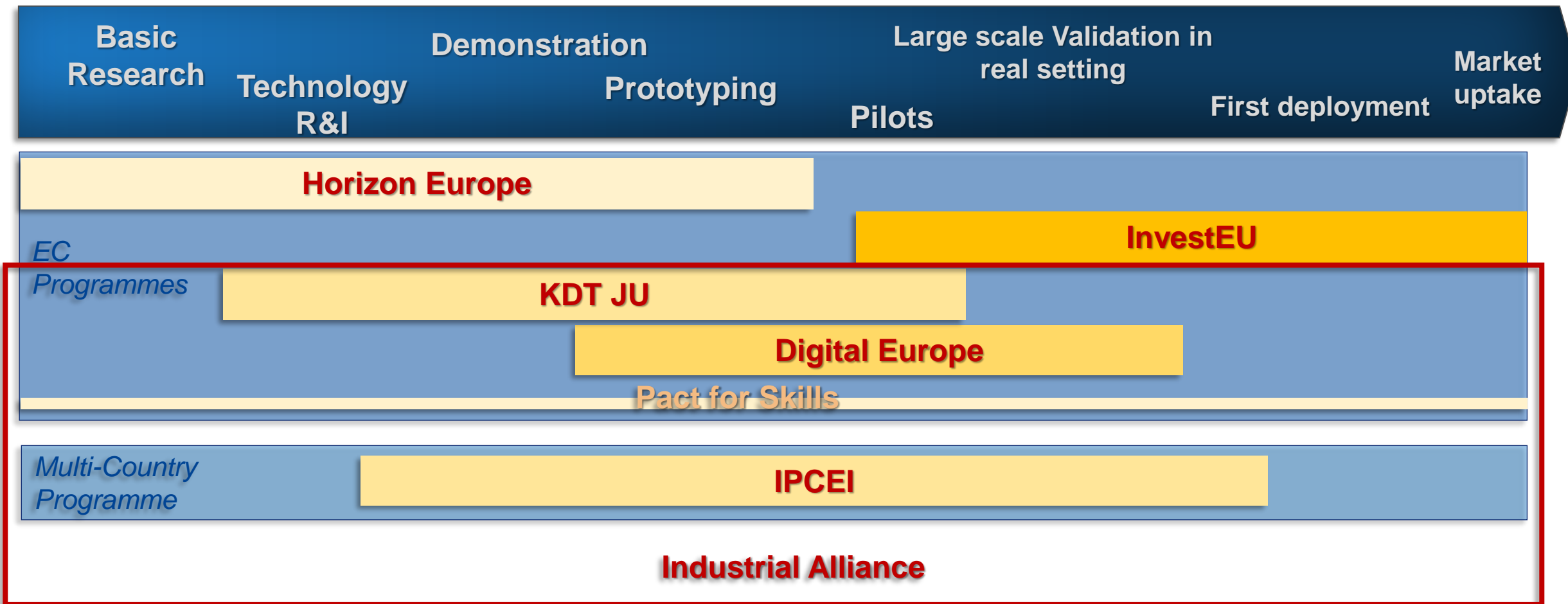
- Mobilize industrial stakeholders through a future **Industrial Alliance**
 - To establish strategic roadmaps and R&I plans for **processor design, deployment and fabrication**
- Address common challenges through various funding mechanisms, including where feasible through the national **Recovery & Resilience plans**
- Design a multi-country project through the development of a proposal for an **Important Project of Common European Interest (IPCEI)**
- **Focus** on processors for **AI, data processing and communication (5G/6G), edge computing**

Overview EC programmes for ECS

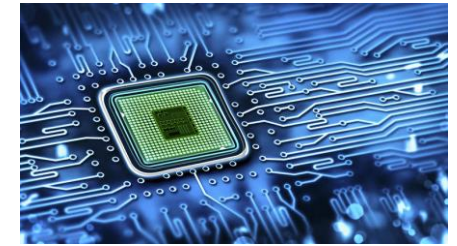


- **Research and Innovation - Horizon Europe**
 - Digital, Industry & Space (Cluster 4)
 - **Key Digital Technologies**, Artificial Intelligence and Robotics, Advanced Computing and Big Data, ...
 - Partnerships
 - **Key Digital Technologies JU** - also Photonics, AI & data, Smart Networks, EuroHPC
- **R&I and first industrial deployment**
 - **IPCEI**
- **Deployment, capacity and skills**
 - Digital Europe Programme, Pact for Skills
- **Investment and support programmes**
 - NextGenerationEU (RRF), InvestEU, EIC

EC programmes for ECS



A new IPCEI on Microelectronics



Objective: strengthen capabilities in digital IC **design** and **manufacturing** for **data processing and communication** towards **leading-edge** and **low-power** technology

Possible areas of development:

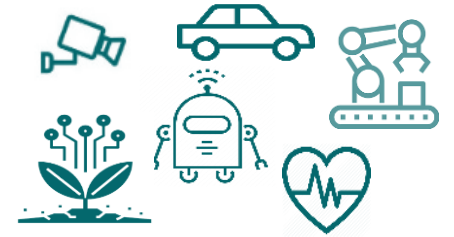
- Design of **low-power processor** cores and **AI chips** for different vertical markets
- Design of chips and systems for **communication** (5G, 6G and other)
- Development of advanced **semiconductor processes** (Beyond Moore, More Moore)
- Advanced packaging for 2D/3D **heterogeneous integration**

Sensing, power electronics, photonics technologies can be integrated if instrumental to the main objectives at system level (eg Edge AIoT)

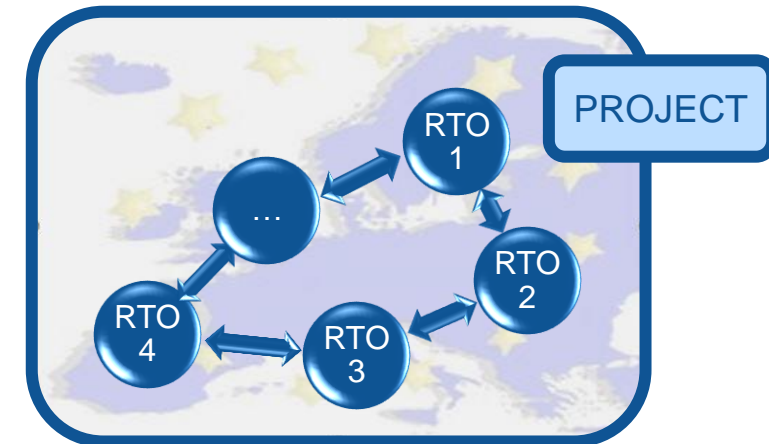
Coordination with **KDT JU** required – higher TRLs, upto First Industrial Deployment

DEP - Edge AI TEF

Edge AI



- Testing and Experimentation Facilities on Edge AI
- TEF Objectives: **European platform** bringing together top EU competences to enable companies of any size to test and experiment innovative **edge AI components** based on advanced **low-power computing technologies** (e.g. neuromorphic computing)
- TEF will offer end-users: fast-track prototyping, pilot production, industry transfer – support to SMEs via DIHs
- Funding covers mostly CapEx for platform infrastructure
- TEF can be accessed by user companies supported through **KDT JU** (OpEx) for Edge AI chip development



Horizon Europe

Destination: Digital Emerging Technologies

Topics: Electronics, Photonics, Low-power processors, AI, 6G, Robotics, Quantum, Graphene

Horizon Europe



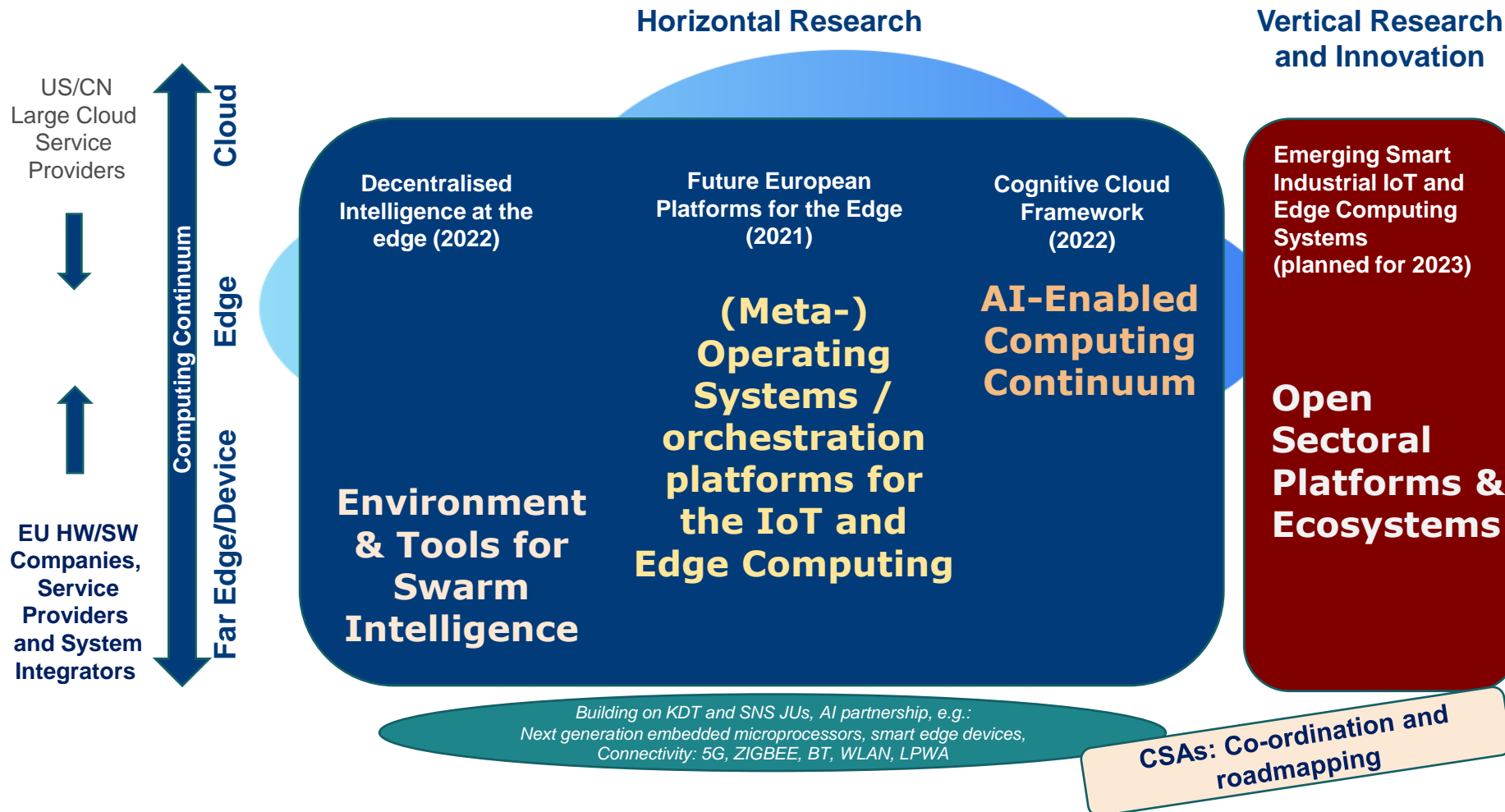
Sections:

- Ultra-low power processors
- European Innovation Leadership in Electronics
- European Innovation Leadership in Photonics
- 6G and foundational connectivity technologies
- Innovation in AI, Data and Robotics
- Tomorrow's deployable Robots: efficient, robust, safe, adaptive and trusted
- European leadership in Emerging Enabling Technologies (spintronics, 2D- materials, quantum sensing...)
- Flagship on Quantum Technologies: a Paradigm Shift
- Graphene: Europe in the lead

First calls: planned in Q3 2021, Q2 2022

From Cloud to Edge to IoT

- Full protocol stack for IoT integration in edge and cloud platforms
- Next generation (meta) operating systems for Edge Computing - Computing continuum



AI, IoT, Edge Computing in KDT JU

Key strategic domain for EU:

- High ambitions – aiming for global leadership
- Need **ecosystem** effort from R&D to pilot lines – strenghten EU's IP

To be kept into account:

- **Coordination** with other ECS-related programmes and instruments: IPCEIs, HE, DEP...
 - **Alignment** of planning – R&I, design and manufacturing
 - Industrial Alliance
- **Collaboration** across constituencies
 - KDT with: IoT, Cloud, AI-data-robotics, 5G (SNS JU), Photonics

Cloud services



Edge server

Edge IOT devices



Digital
transformation

Green Deal



Thank you

Marco Ceccarelli
DG CONNECT
European Commission



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