DRIVING INNOVATION & DISRUPTION: EDGE-AI MADE IN / BY & FOR EUROPE





TARGETS FOR INNOVATION & DISRUPTION IN 2025

Innovation and disruption: Market volume in 2025 (in Bill. €)





Source: McKinsey

DRIVEN BY MICROELECTRONICS IN 2025:

Innovation and disruption to which Microelectronics will be a major enabler:





DRIVERS FOR EDGE-AI

Power efficiency

- Dedicated ASICs accelerate inference of Neural Networks up to 200 times
- Using a fraction of power needed when using CPU/GPU
- Form factor

hunhunhun

- Some applications demand very small form factors, costs
 - 3D-integration and integration into sensor design
- Latency
 - High data-throughput from sensors (high res, high rates) needs to be managed locally
 - Industrial and automotive applications require lowest latency

Get Al off the cloud



EUROPE BETWEEN US AND CHINA – OPPOSITES?

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USA	Europe	China
Strong push for Big Data business models	Weak push for Big Data business models	Strong push for Big Data business models
Strong Big Tech Companies	No Big Tech Companies	Strong Big Tech Companies
Weak Data Protection regulations	GDPR as a market strength	Very weak Data Protection regulations
Drive for Cloud-based Al	Drive for Local AI	Drive for Cloud-based Al
High CAPEX effort	Low CAPEX effort	Huge CAPEX effort
High energy consumption	Better energy efficiency	High energy consumption



EUROPE'S CHALLENGE AND OPPORTUNITY – EDGE AI

- Artificial Intelligence (AI) at the Edge to create the next European market and industries
- European data sovereignty requires trusted and secure digital hardware and software for systemic cybersecurity
- Trusted and robust European hardware for new generations of devices and sensors is essential across all strategic sectors and markets



- Demand for strong and complete supply and value chains from research to end-user chips, devices and systems »Made in Europe«
- Action needed for the joint-expenditure to deploy, advance and own Edge-AI based technologies and products in Europe.



EMERGING TECHNOLOGIES NEW OPPORTUNITIES FOR A GLOBAL INDUSTRY

- Neuromorphic computers: New computer architectures based on neural networks for Artificial Intelligence (AI)
- **Trusted electronics**: Authentic and safe complex integration
- Advanced wireless network technology: photonic communication, 5G/6G
- Quantum technologies for secure communication, quantum computers, powerful quantum algorithms



WHY CARE ABOUT TRUST IN ELECTRONIC Breakthrough silicon scanning discovers backdoor in military chip

Electronic components may have:

- Backdoors, kill-switches, Trojans, vulnerabilities, …
- Most common vulnerabilities are unintended but still critical

Examples of security risks through electronic components

- Side channel weaknesses in CPUs compromise security
- Trojans in server- and communication infrastructure (5G)
- Backdoors in military chips
- Intel management engine used as backdoor





WHAT IS TRUSTED ELECTRONICS?



DEFENSE ADVANCED RESEARCH PROJECTS AGENCY

- DARPA released a large program in 2016
- Main agenda items are:
 - Trusted IP library
 - Trusted design
 - Low volume chip production
 - Trust establishment by chip verification
 - Supply chain tracking and protection



https://www.darpa.mil/about-us/darpa-approach-to-trusted-microelectronics



Forschungsfabrik Mikroelektronik Deutschland

- Germany upgrades its microelectronics technology infrastructure
- Funded by the German Ministry for Research
 - € 350M capex
 - Founded in 2018
 - 11 Fraunhofer and 2 Leibniz (WGL) Institutes
 - 11 cleanrooms @ 13 institutes
 - Joint business office, 4 technology parks
- Increase of efficiency and improvement of technological basis by joint organization across Institutes
- Role model for EU collaboration



Bundesministerium

für Bilduna

und Forschung



Our customers





EXAMPLE PROJECT: UNIVERSAL SENSOR PLATFORM (USEP)

- Trend in IoT: Miniaturization, high performance, low-power
- Challenge for medium to small companies:
 - High development costs
 - Want standard off-the-shelf products
 - Time-to-market is crucial
- Partners: Global Foundries and Fraunhofer Institutes
- Highly integrated package using cutting-edge technology
 - Processors, Sensors, Wireless communication
 - Software libraries
 - Individually configurable according to customer needs
- Fabricated in Global Foundries' 22FDX technology





Europe's First Steps in Edge-AI / ECSEL

MRAM

FeRAM

PCRAM

OxRAM



ntineon **"TEMPO"** : Neuromorphic HARDWARE **ECSEL 2018** (19 partners, 33 ME budget) Spiking Algo. Deep Far-Out Neural Learning Innovative Design : CNN and SNN Networks Impl. BOSCH **Different Memories** Spike Transient Mixed-Signal **Production-Level Maturity** Processing Arithmetic CEA Analog imecNL imec FhG SpiNNaker Digital Silicon Technology SIC.VLIW. FPGA Contemporary **Digital NoC** GPU. CPU I hales 300mm Silicon wafers TEMPO Scope 22 and 28nm FDSOI technology a Thales / Leonardo company Next EU proposal: "ANDANTE" (ECSEL 2019)



CONCLUSION: THE CASE FOR AN EDGE-AI TEF AND PLATFORM

Europe needs a TEF platform for Edge AI

- to create critical mass for industrial support
- to provide fast track prototyping and initial-scale production (pre-economic level) to EU large companies,
 SMEs and Start-Ups
- to provide fast increased added value in the European value chains of Key Digital Technologies
- TEF Edge AI underpins almost all sectors, technologies and services
- **CEA-Leti, Fraunhofer/FMD and imec are already joining forces** (MoUs and partially NDAs in place)
 - to combine expertise and strengthen the European IP base
 - to avoid redundancies and duplication
 - to broaden the competences and research services to industrial stakeholders
- **Collaboration role model FMD in Germany in operation since 2 years**



THE LAST SLIDE



Thank you for your attention!



