Cyber Physical Systems for Europe

EFECS 2021 – Day 2 – Session 1
Impact of ECS value chain on a competitive Europe

Pre-Integrated Architectures for sustainable complex Cyber-Physical Systems

Philippe Gougeon – Valeo Comfort and Driving Assistance – Creteil, France

Videoconference – November 24th, 2021

INTRODUCTIONS

CPS4EU Project

- Managed by ECSEL JU
- 36 Partners from 5 European Countries
- 53 M. Euro budget
- 16 use cases in Automotive, Industry, Energy and for SMEs
- 7/2019 to 6/2022

- Web site: www.cps4eu.eu
- LinkedIn group: www.linkedin.com/groups/12372370/

10 Large Enterprises

Valeo, LEONARDO, THALES, Schneider Electric, TRUMPF, WIKA MOBILE CONTROL, Rte, EUROTECH, acoem, ANSYS

10 Academics and RTOs

cea, cnrs, Université Grenoble Alpes, CentraleSupélec, Universität Augsburg University, ITI Instituto Tecnológico de Informática, inria, vicomtech, TU Clausthal

14 SMEs: Technology providers

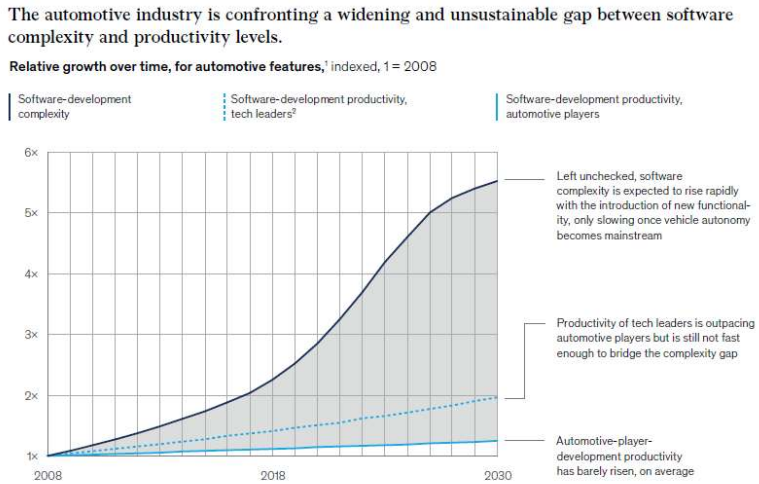
Airlane Technologies, acs plus data with care, ARCURE, m3 SYSTEMS, emmtrix Technologies, SEQUANS COMMUNICATIONS, GREENWAVES TECHNOLOGIES, sysnav, PROVE & RUN, VSORA, GlobalSensing Technologies, KALRAY, spinsplit, SHERPA ENGINEERING

2 Dissemination organizations

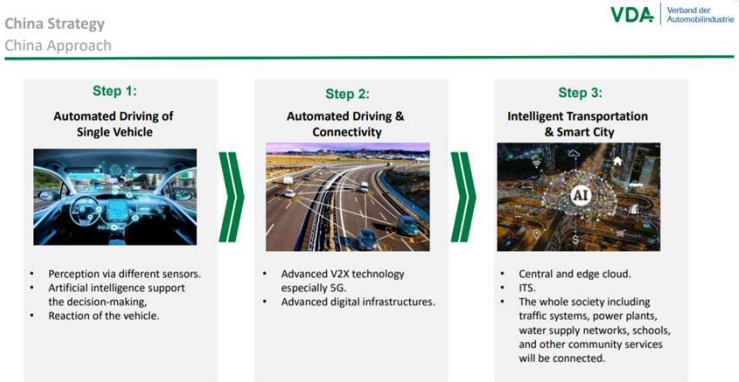
CAP'TRONIC, Embedded France

This project has received funding from the ECSEL Joint Undertaking (JU) under grant agreement No 826276. The JU receives support from the European Union's Horizon 2020 research and innovation programme and France, Spain, Hungary, Italy, Germany

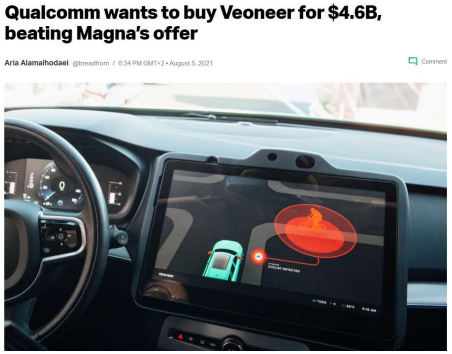
EVOLUTIONS OF THE CPS* LANDSCAPE



[McKinsey, The case for an end-to-end automotive software platform, January 2020]



[VDA, China strategy, July 2020]



[Tech Crunch, August 2021]

- Increasing complexity of projects
- New powerful aggressive industrial players
- Long term goals, long term business models

(*) CPS: Cyber Physical Systems

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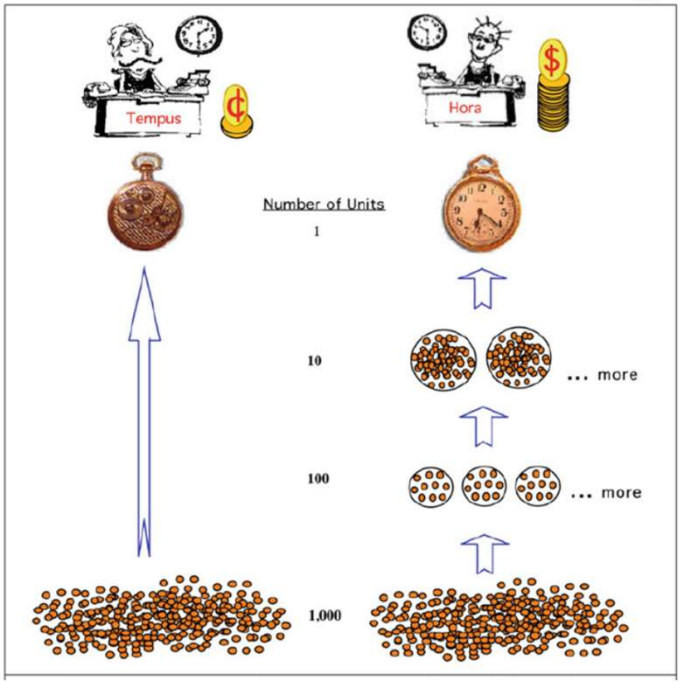
EVOLUTIONS OF THE CPS* LANDSCAPE

How to balance end user + societal expectations and sustainability ?

- **Functional safety**
- **Cybersecurity**
- **Privacy and Ethics**
- **IP rights**
- **Export rules**
- **Liability**
- **Traceability**
- **CO2 neutrality, Life cycle analysis**
- **Minimal usage of natural resources**

(*) CPS: Cyber Physical Systems



[J.Wu, Hierarchy theory: an overview, 2013. Illustration of the watchmaker parable, based on the description in H.Simon, 1962]

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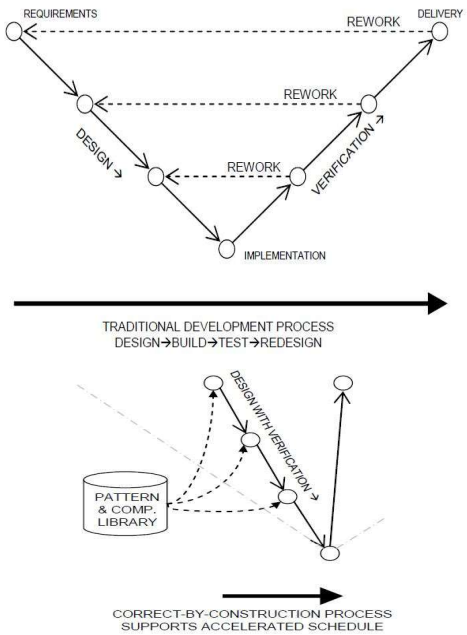
PRE-INTEGRATED ARCHITECTURES

Design Pattern concept extended to complex Cyber-Physical Systems

- Reduction of the R&D effort
- Trustworthy-oriented Architectures
- For three CPS layers: Physical, Cyber and Internet of CPS
- Manageable size: not too large, not too small
- Scalability for networked eco-systems
- Compatibility with legacy components, processes and tools
- Inter-operability with other components or tools
- Pre-validated concepts to ensure homologation
- Flexibility to be configurable for the developer needs
- Possibility to be extended with new additional features



[D.Coffer et al.,Rockwell-Collins, Complexity-reducing design patterns for cyber-physical systems, 2011]

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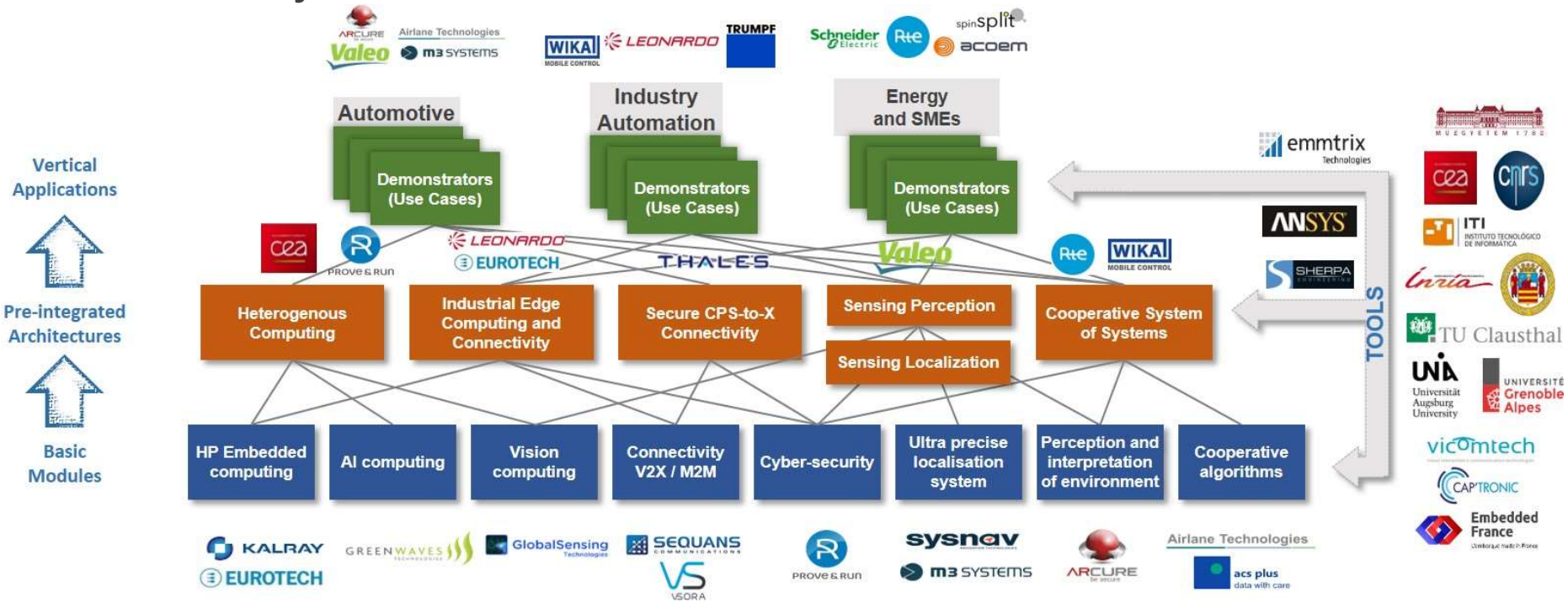
PRACTICAL IMPLEMENTATIONS

CPS4EU Eco-system



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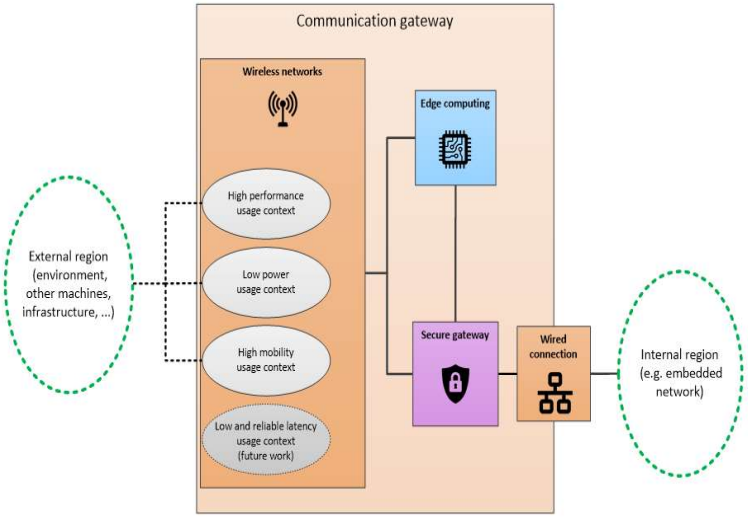
PRE-INTEGRATED ARCHITECTURES

6 PIARCHs from CPS4EU

- Secure CPS-to-X connectivity
- Heterogenous computing for AI
- Cooperative system of systems
- Industrial edge computing gateway
- Sensing perception
- Sensing localization



Secure CPS-to-X connectivity PIARCH

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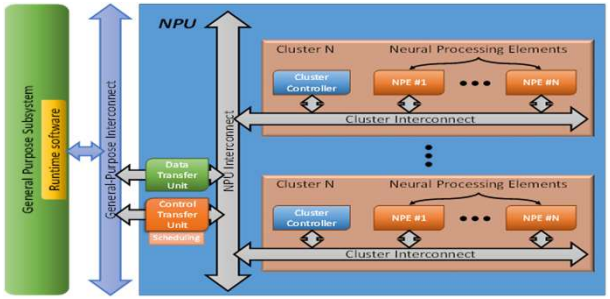
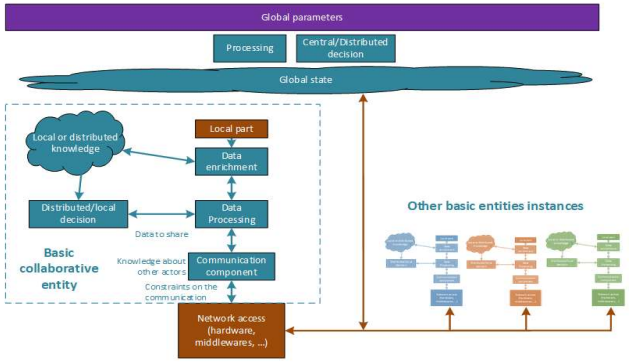
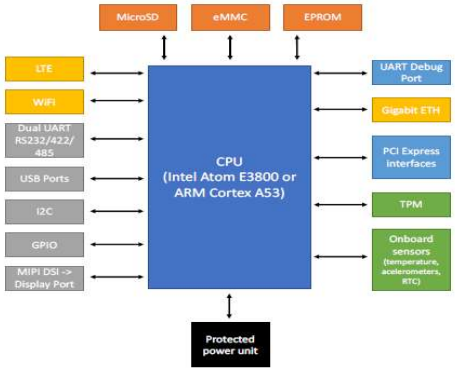
PRE-INTEGRATED ARCHITECTURES



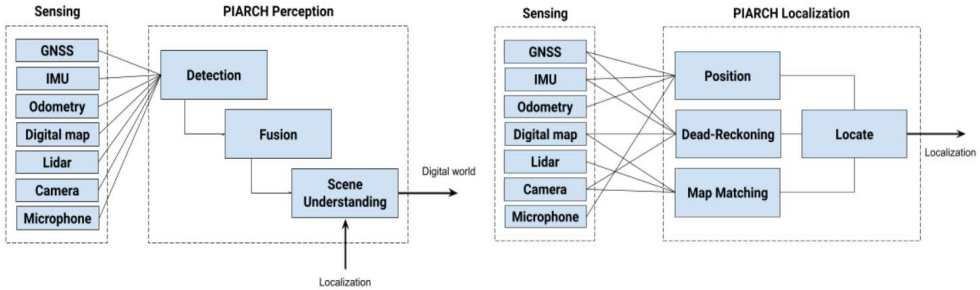
Heterogenous AI computing PIARCH



Cooperative system of systems PIARCH



Industrial Edge computing gateway PIARCH



Sensing perception and localization PIARCHs

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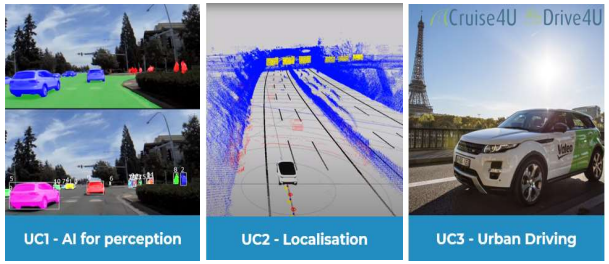
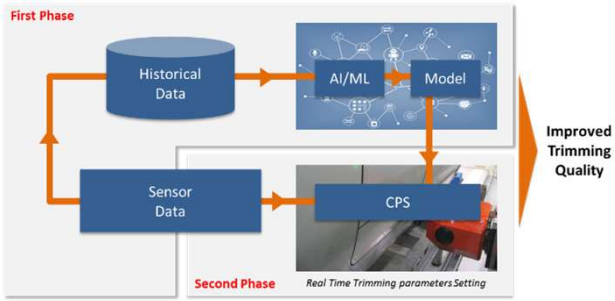
PRACTICAL IMPLEMENTATIONS

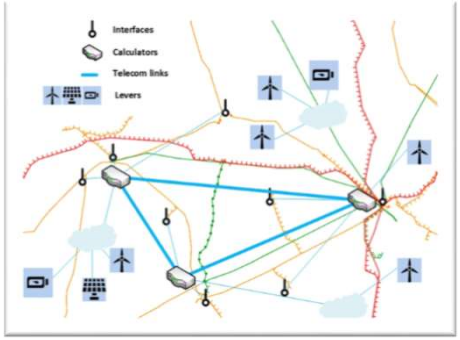
16 Use cases using at least 1 PIARCH (TRL 6-7)



Automotive use case (Valeo) – Urban automated driving



Industry automation use case (Leonardo) – Improved trimming quality



Energy use case (RTE) – Distributed controls for energy transmission network

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CONCLUSIONS

Pre-Integrated Architectures for sustainable complex Cyber-Physical Systems

- Solution to reduce R&D Efforts for complex CPS developments
- Practical approach for current and upcoming challenges
- Fits well to networked eco-systems
- Meets expectations of large companies, SMEs and tool providers

- Visit our virtual booth at EFECS 2021 (Go to the Marketplace, then select CPS4EU)

- Contact our project partners for more information:
https://cps4eu.eu/wp-content/uploads/2020/11/CPS4EU-presentation-Summary.pdf

- Or contact by email philippe.gougeon@valeo.com

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THANK YOU FOR YOUR ATTENTION