The CPS4EU project:
Pre-Integrated Architectures for sustainable complex Cyber-Physical Systems

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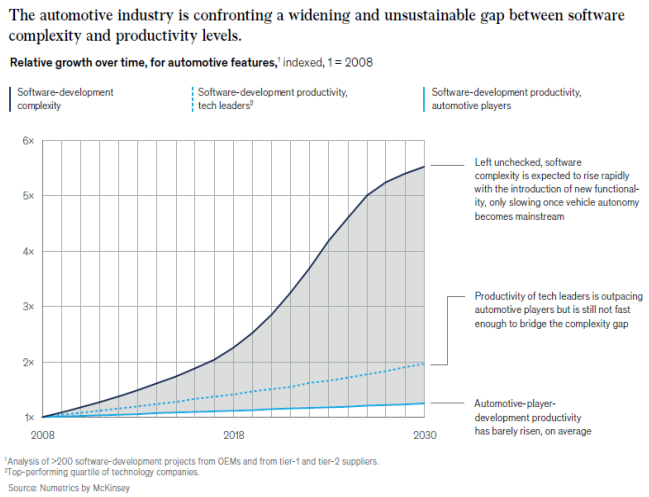
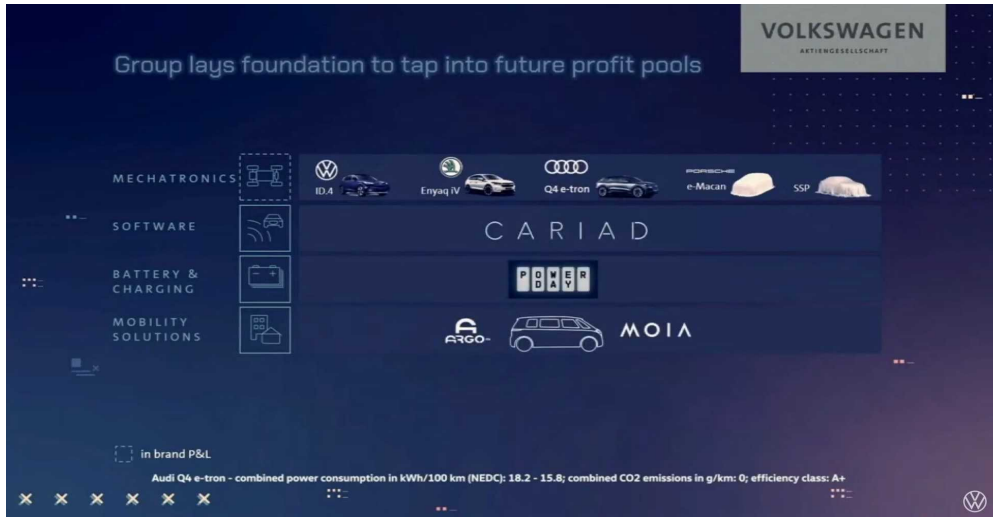
Etienne HAMELIN | CEA

EVOLUTIONS OF THE CPS* LANDSCAPE



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



[Volkswagen Group – New Auto strategy, July 2021]

[VDA, China strategy, July 2020]

- Increasing complexity of projects
- Software is the differentiator, scale is key
- New powerful aggressive industrial players
- Long term goals, long term business models

(*) CPS: Cyber Physical Systems

Qualcomm wants to buy Veoneer for $4.6B, beating Magna's offer

Aria Alamalhodaei @breadfrom / 6:34 PM GMT+2 • August 5, 2021

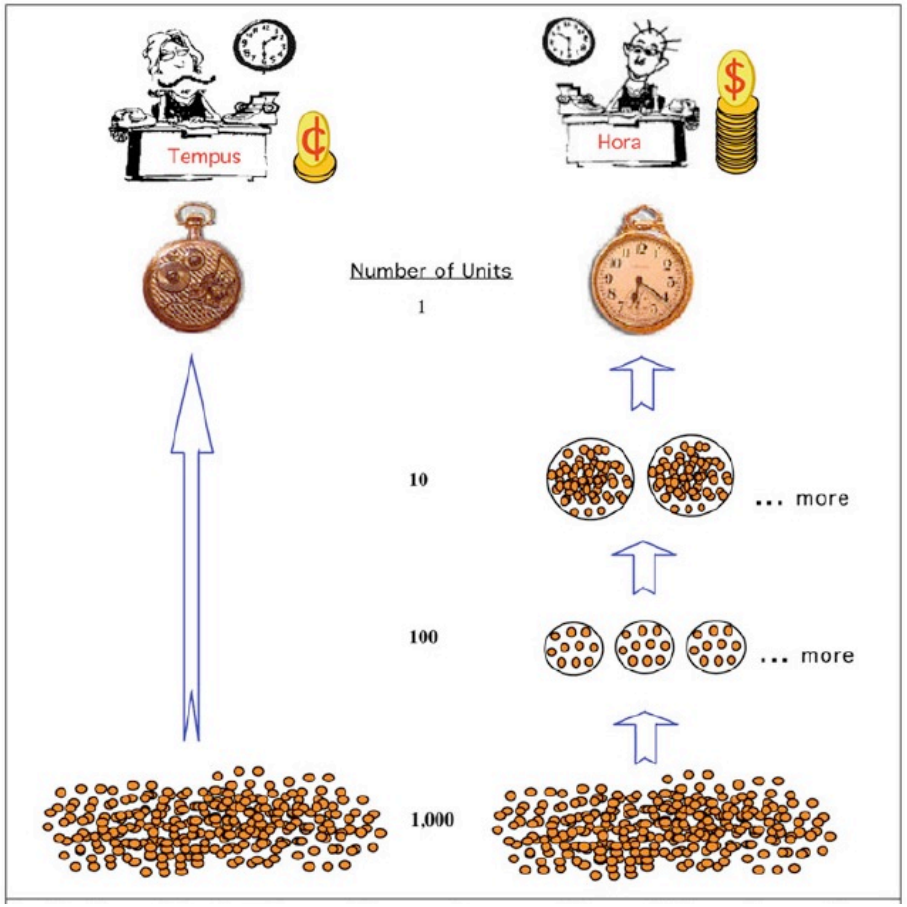
[Tech Crunch, August 2021]

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]

CPS4EU – Typologies of Cyber-Physical Systems

NIST Framework for CPS (2017)

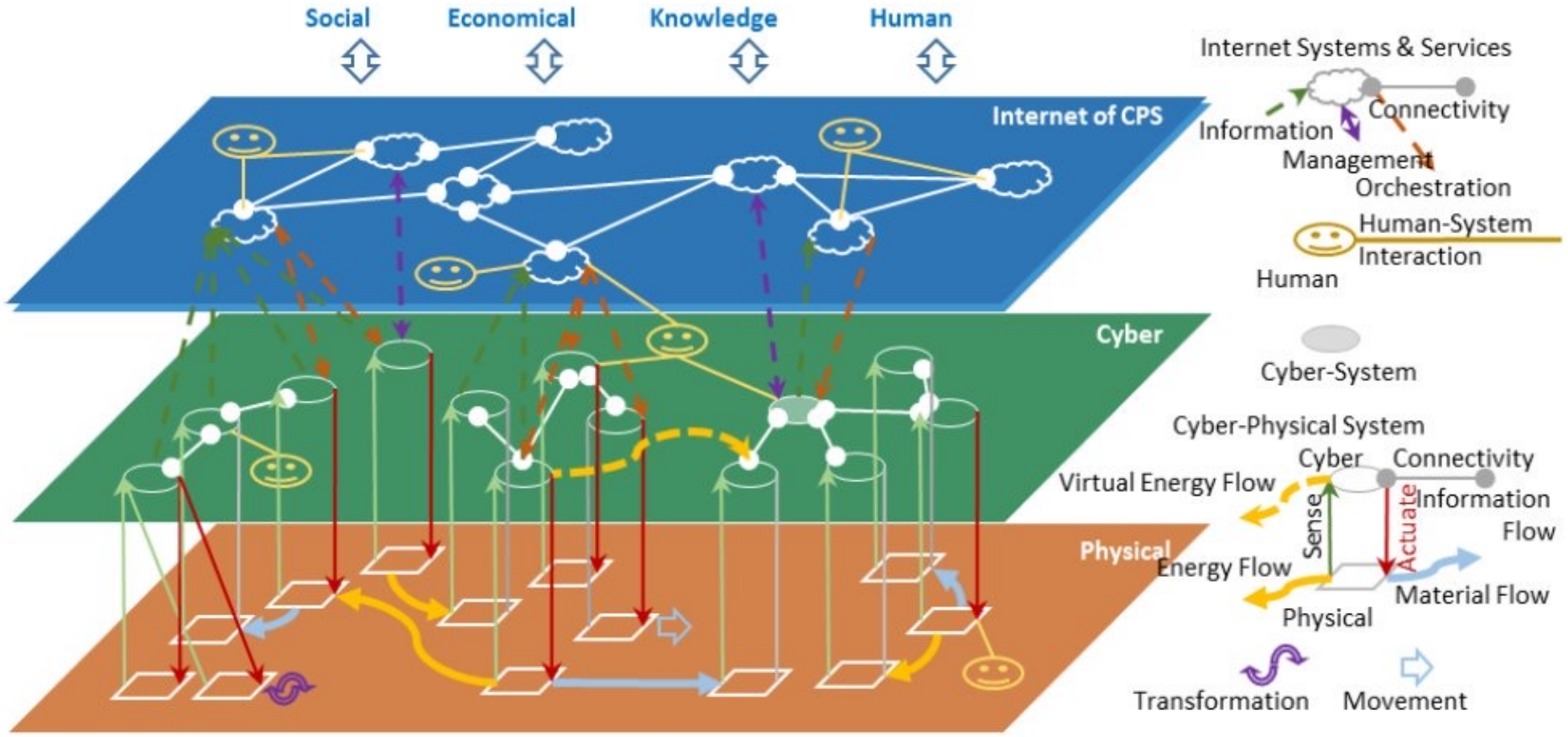


Figure 14: A CPS View: Systems of Systems

OVERVIEW

The 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:

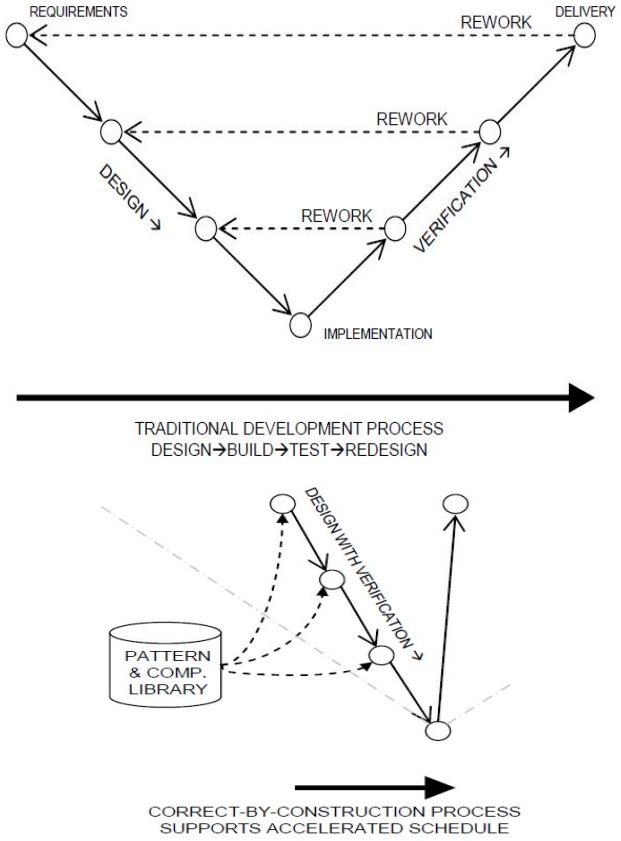
  www.cps4eu.eu
- LinkedIn group:

  www.linkedin.com/groups/12372370/

PRE-INTEGRATED ARCHITECTURES

The Design Pattern concept extended to complex Cyber-Physical Systems

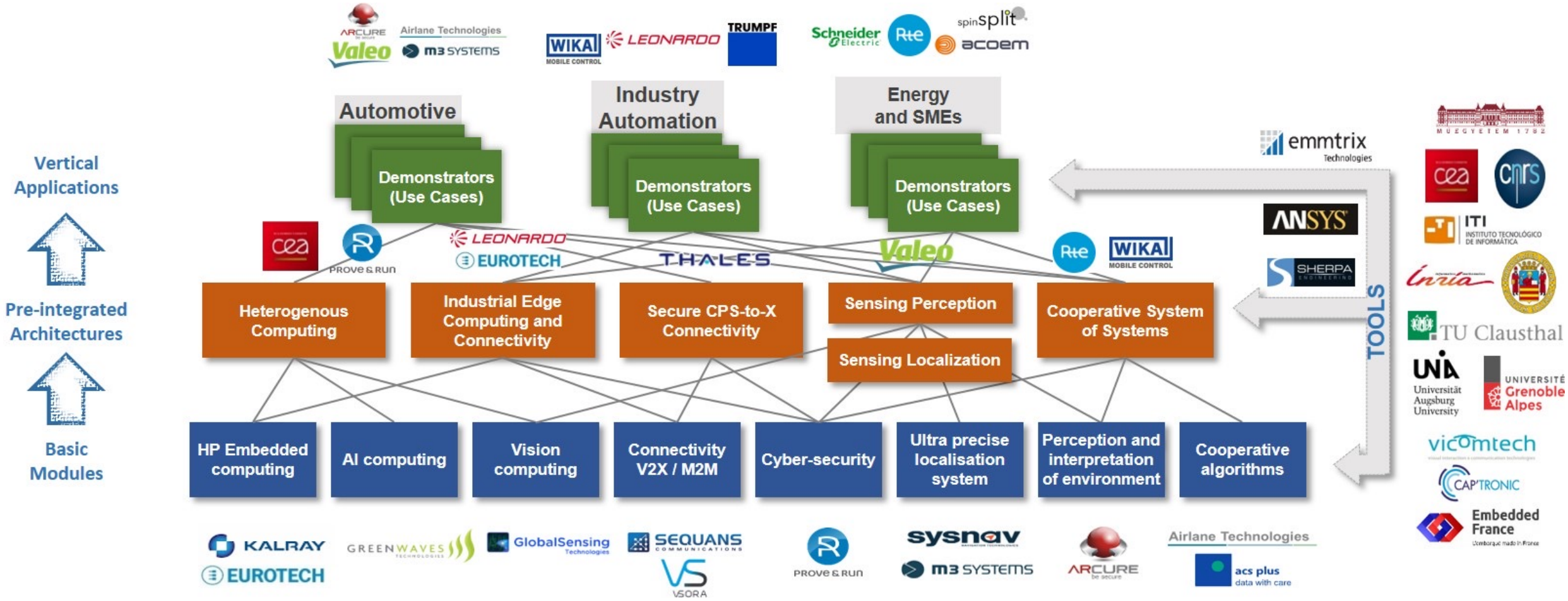
- Reduction of the R&D effort
- Trustworthy-oriented Architectures
- For three CPS layers: Physical, Cyber and Internet of CPS
- Manageable size: not too large, not too small
- Scalability for networked eco-systems
- Compatibility with legacy components, processes and tools
- Inter-operability with other 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]

PRACTICAL IMPLEMENTATIONS

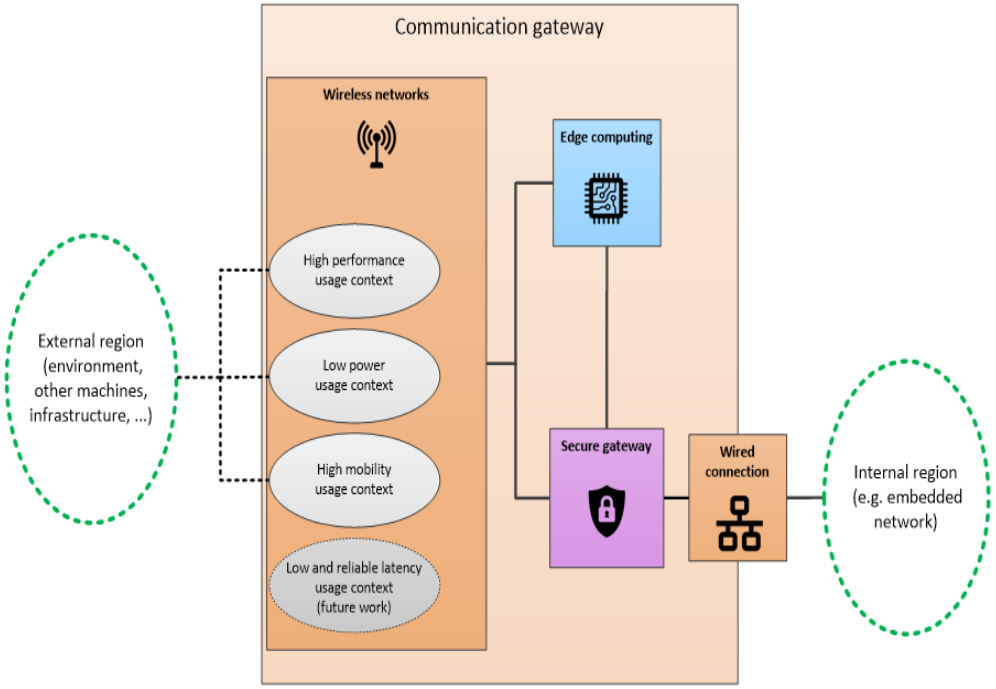
The CPS4EU Eco-system



PRE-INTEGRATED ARCHITECTURES

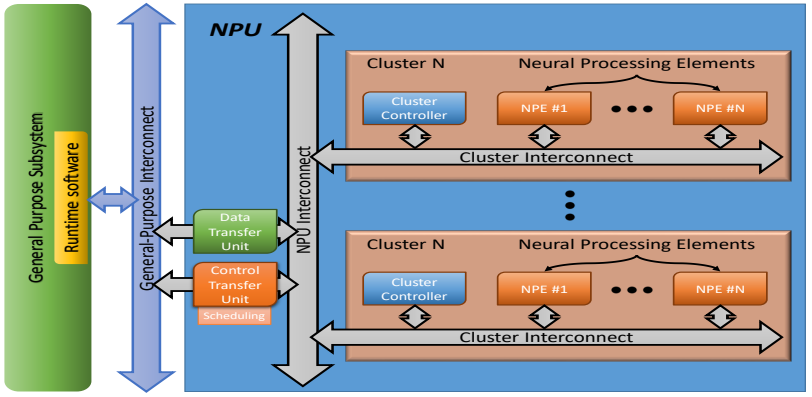
6 PIARCHs from CPS4EU

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

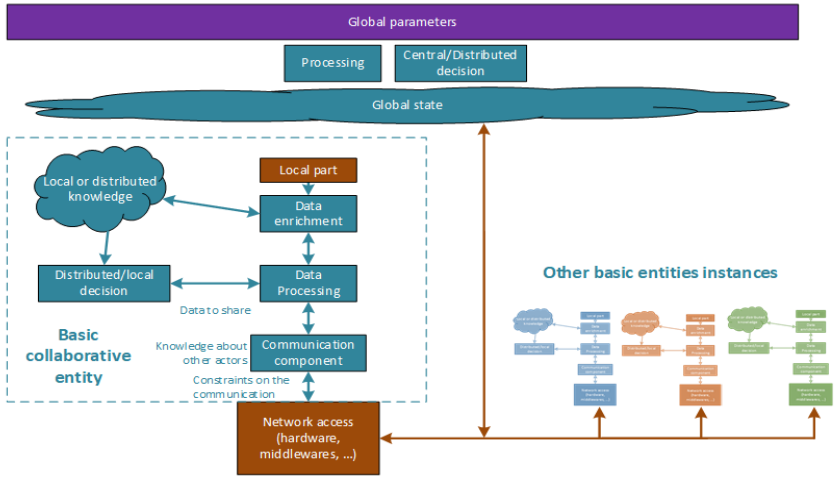


Secure CPS-to-X connectivity PIARCH

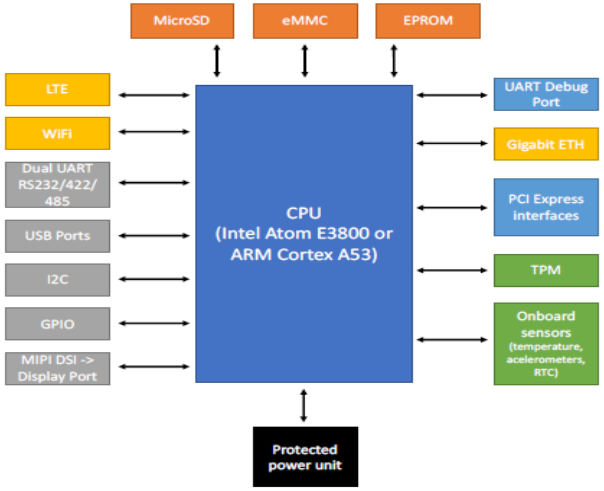
PRE-INTEGRATED ARCHITECTURES



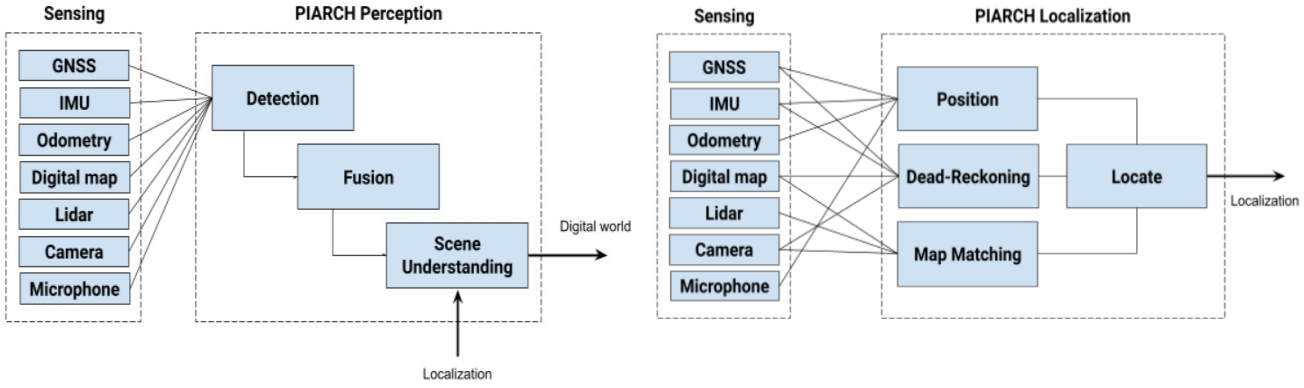
Heterogenous AI computing PIARCH



Cooperative system of systems PIARCH



Industrial Edge computing gateway PIARCH



Sensing perception and localization PIARCHs

PIARCH Perception for autonomous systems

Valeo Mobility Kits
Sensors, software and tools for new mobility players (NMP) and other technological markets

Valeo

Web site:
www.valeo.com
Contact:
Pedro Moreno-Lahore
Business development manager
Email:
cda.valeo-mobilitykits.mailbox@valeo.com



Sensors


Ultrasonic HP Kit (Basic)

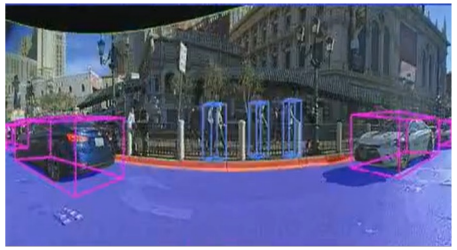

Surround View Cameras 1 Mpix (Gen 2)


Lidar (Scala gen1)


Lidar (Scala gen2)

Software

DEEP MANTA AI
3D/2D Objects perception & semantic segmentation



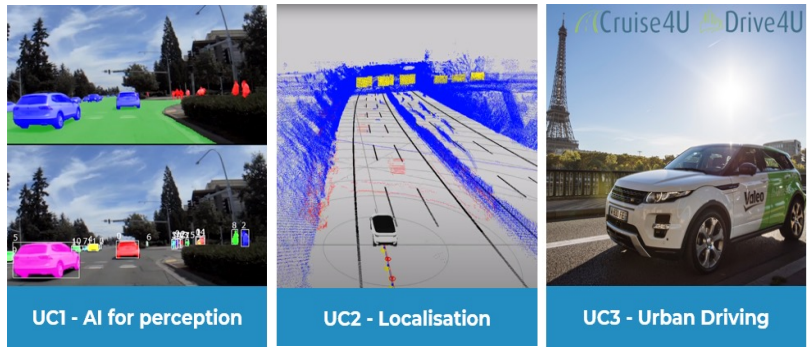
AUTONOMOUSTUFF

Also available on **Autonomous Stuff.com**

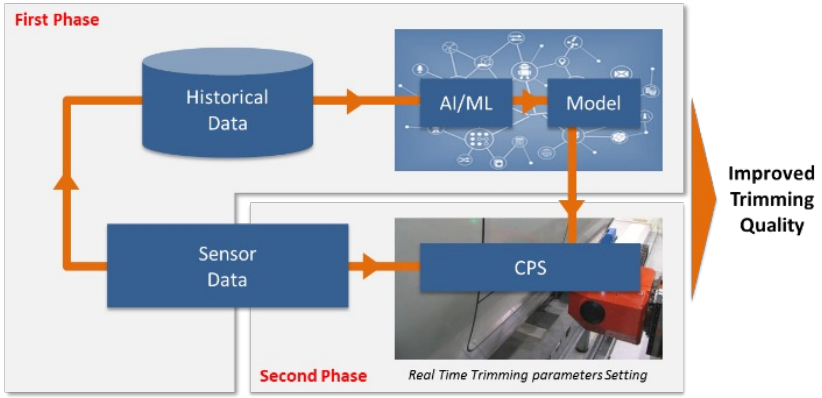
More coming soon...

PRACTICAL IMPLEMENTATIONS

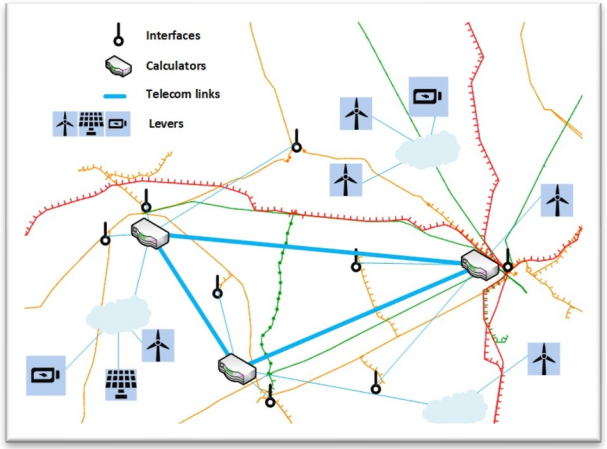
16 Use cases using at least 1 PIARCH (TRL 6-7) – Large Enterprises



Automotive use case (Valeo) – Urban automated driving



Industry automation use case (Leonardo) – Improved trimming quality

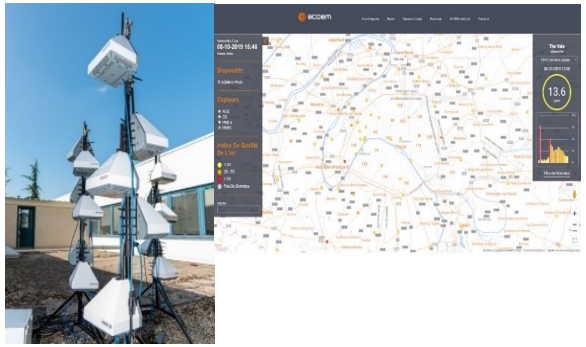


Energy use case (RTE) – Distributed controls for energy transmission network

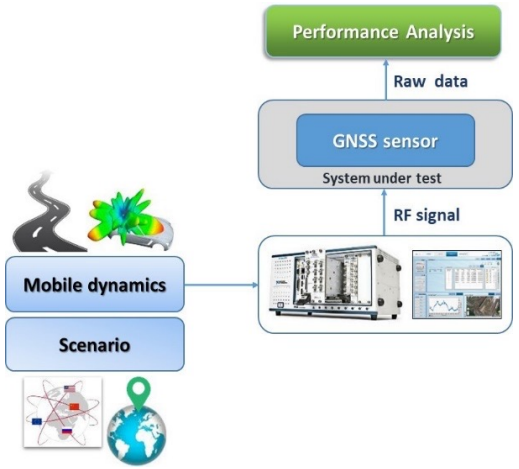
PRACTICAL IMPLEMENTATIONS

16 Use cases using at least 1 PIARCH (TRL 6-7) – Small & Medium Enterprises

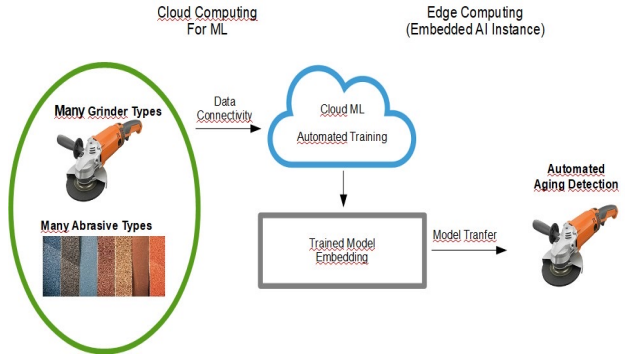
SME use case (Arcure)
Pedestrian detection on off-road construction trucks



SME use case (ACOEM)
Monitoring network for environment quality and threat detection



SME use case (M3S)
Open loop test bench for GNSS positioning



SME use case (Airlane)
SaaS for intelligent motor control application on handheld tools

CONCLUSIONS

Pre-Integrated Architectures for sustainable complex Cyber-Physical Systems

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

- 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** et **etienne.hamelin@cea.fr**

- Thank you for your interest about CPS4EU
- Merci **Captronic** and **Embedded-France** for your contributions to the CPS4EU project
- Add a blocker in your agenda on **9-10/11/2022** for our final event !