EC HORIZON2020
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Distributed control and simulation platform to support an ecosystem of digital automation developers

Interoperability, modularity and scalability: IEC-61499, a standardized platform to unify European digital automation

Franco A. Cavadini, CTO, Synesis

The need for «Digital» Manufacturing

Evolving requirements of the manufacturing sectors:

- Rising product variety
- Increasing relevance of value networks
- Shortening product life cycles
- Quick variation of demand
- Request for high quality and customized products

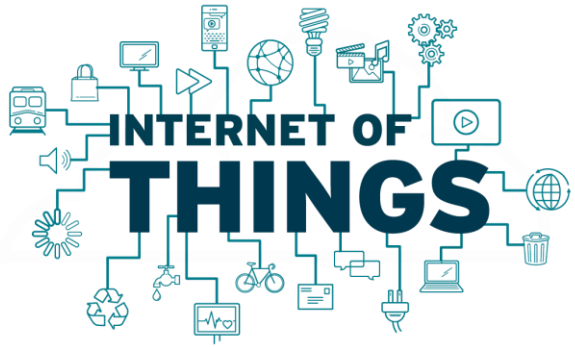
Needs of new automation solutions to enable:

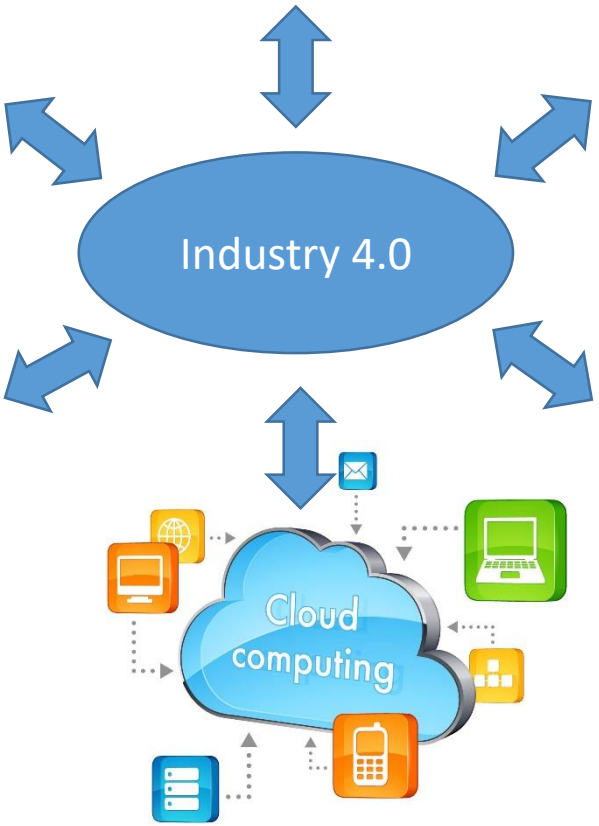
- *Flexibility and re-configurability*
- *Increased production performance*
- *Reduced energy consumption*
- *Better environmental footprint*





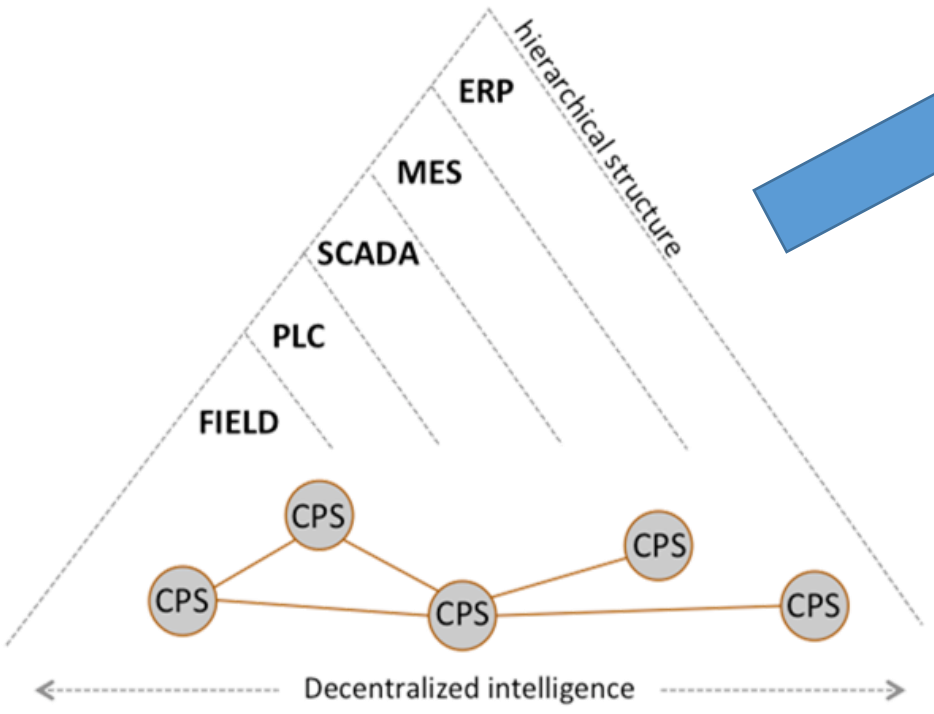

“Industrie 4.0”: where are we struggling?

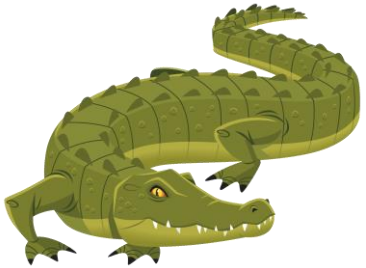


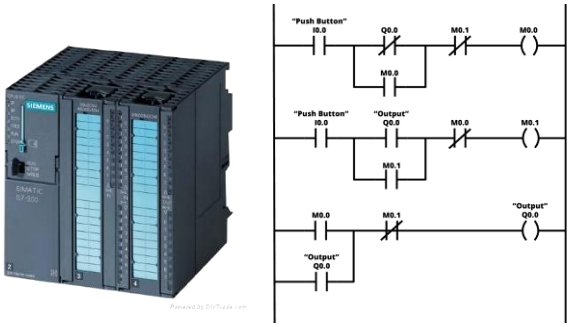


“Industrie 4.0”: where are we struggling?

Seamless interfacing to the digital domain



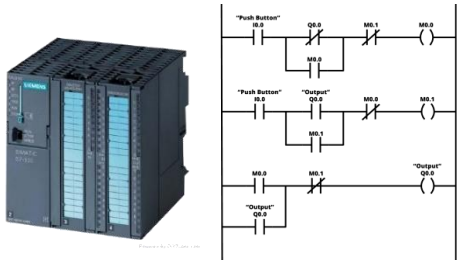




Vertical integration across levels

Current limits of industrial automation

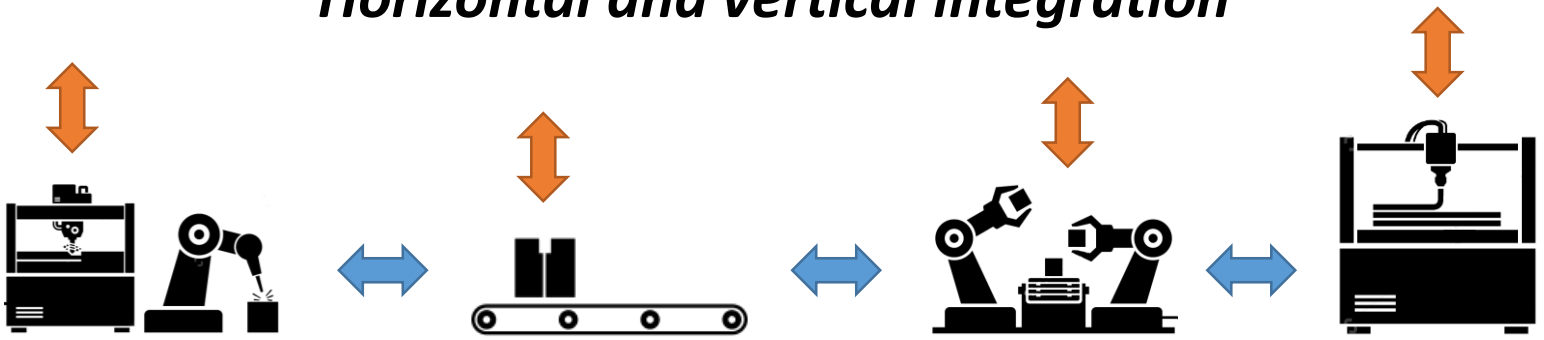
IEC-61131 technologies, a legacy of the 90ies



Cyber-Physical Systems		**IEC-61131**
CPS automation development requires specifically conceived **Object-Oriented** approaches	→	The 5 languages of the standard are **informatically "old"**
Tools of the "Digital" domain are all **event-based**	→	Current PLCs are programmed under a strictly **time cycle-based** paradigm
The distributed intelligence of CPS must be **orchestrated** to achieve complex behaviours	→	IEC-61131 is **not conceived to** simplify the development of distributed control applications

Trends of innovation already exists but…

Horizontal and vertical integration



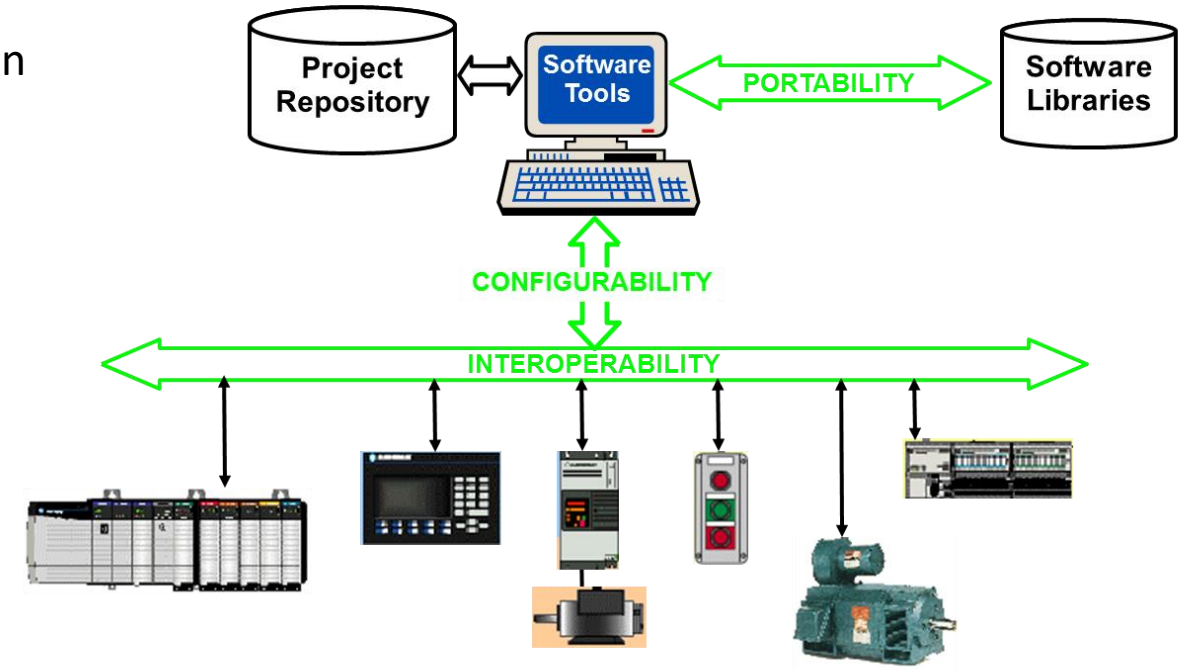
- SOA is a possible approach, OPC-UA is applicable to this scenario
  - ***But M2M requires fast real-time communication;***
- The DDS (Data Distribution Service) standard proposes a high-performance, secure real-time middleware for communication between distributed devices
  - ***But it deals only with communication and not with engineering of intelligence.***
- XMPP (eXtensible Messaging and Presence Protocol) provides a secure and extensible approach to real-time distributed messaging
  - ***But it needs to be integrated on top of another platform.***

IEC61499 to avoid re-inventing the wheel

From 2005…

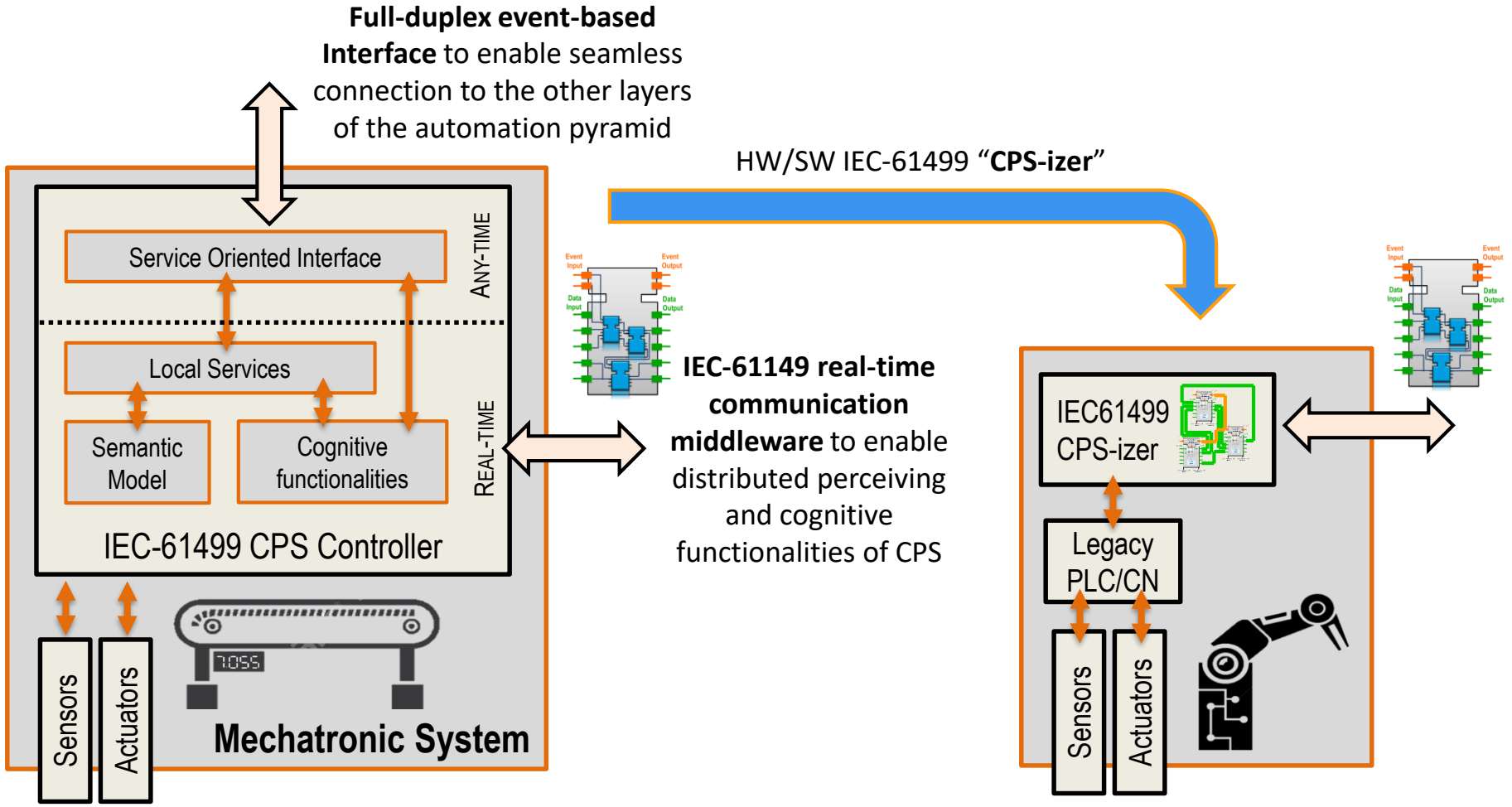
James H. Christensen

Open Distributed Architecture Requirements



IEC61499 to avoid re-inventing the wheel

Exploiting the already existing IEC-61499 standard to deploy CPS



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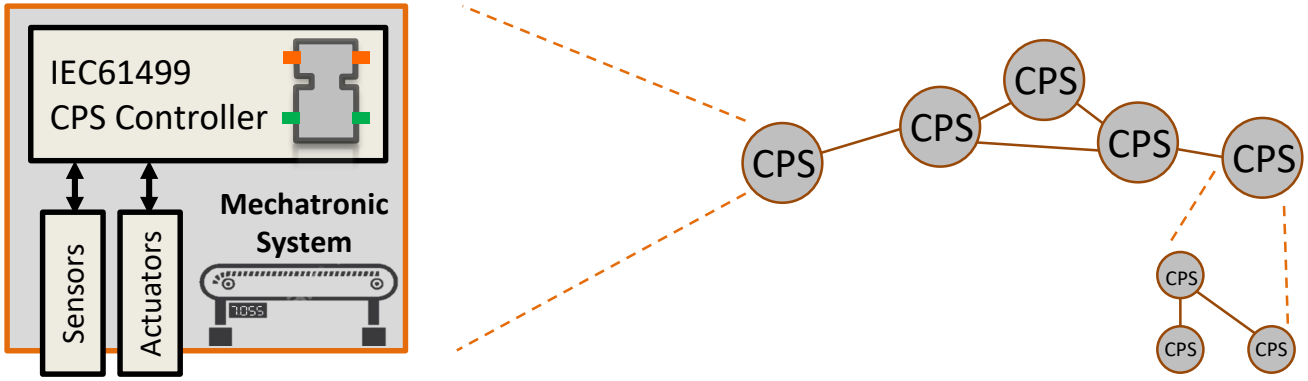
Exploiting the already existing IEC-61499 standard to deploy CPS

"Automation Object Orientation (A-OO)"



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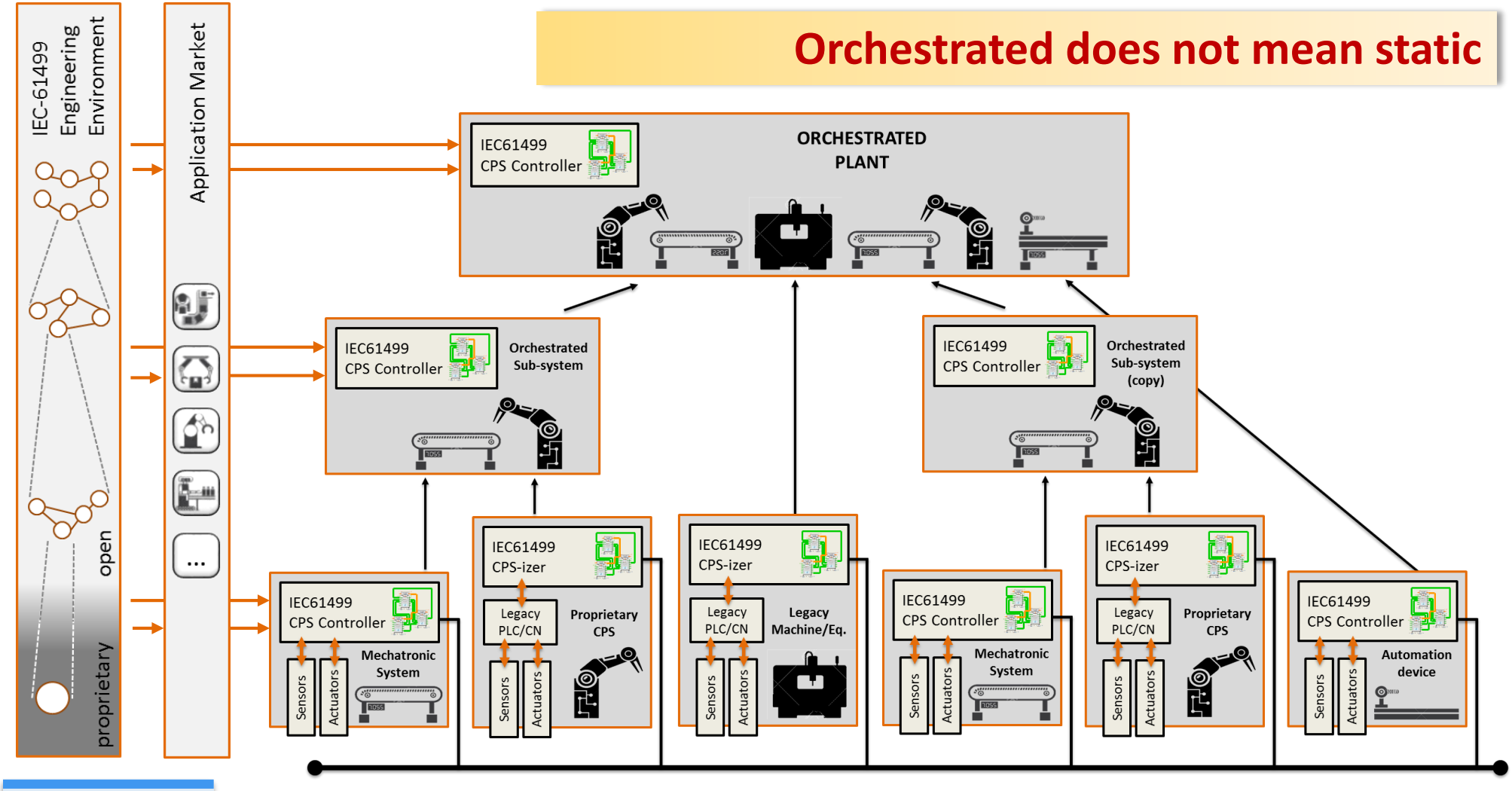
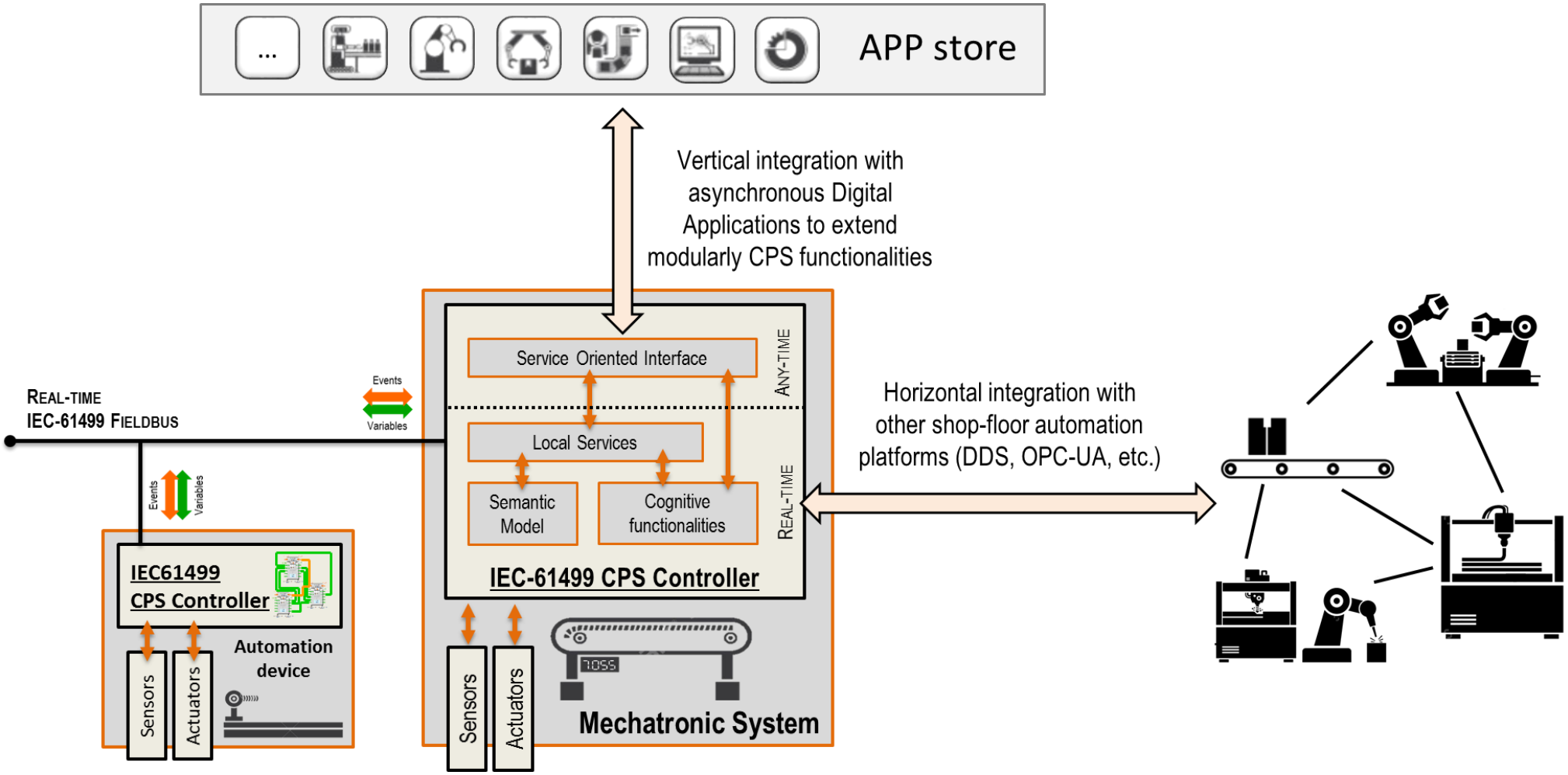
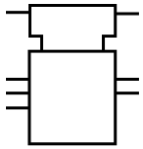


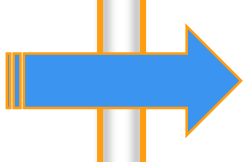
IEC-61499 open approach
= Integrability with other technologies



Where we are and what is missing

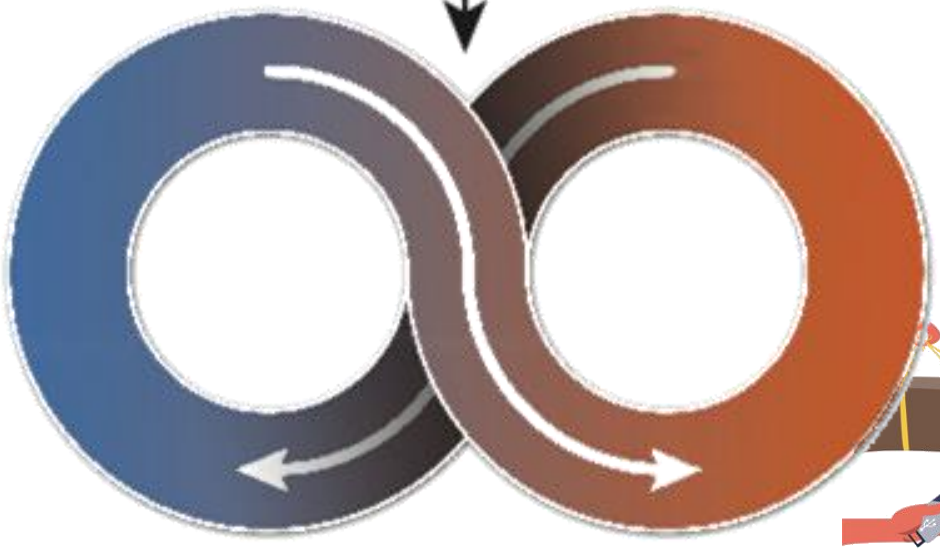


IEC-61499



	IEC-61499	DAEDALUS
Modern development language	Interoperable event-based object orientation	Reference implementation of IDE for CPS development
Interoperable real-time middleware	Real-time (non strict) and pre-defined topology	Auto-discovery and auto-binding over strict real-time
Orchestration development framework	Supervised orchestration of distributed devices	SDK to design optimal distributed control solutions
CPS interface	Possible but not defined	Extension of automation objects to include/interface with behavioral models
“CPS-izing” mechanism	Only over non-real-time buses	HW/SW wrapping of legacy and/or proprietary systems

Technology is not enough, we need…

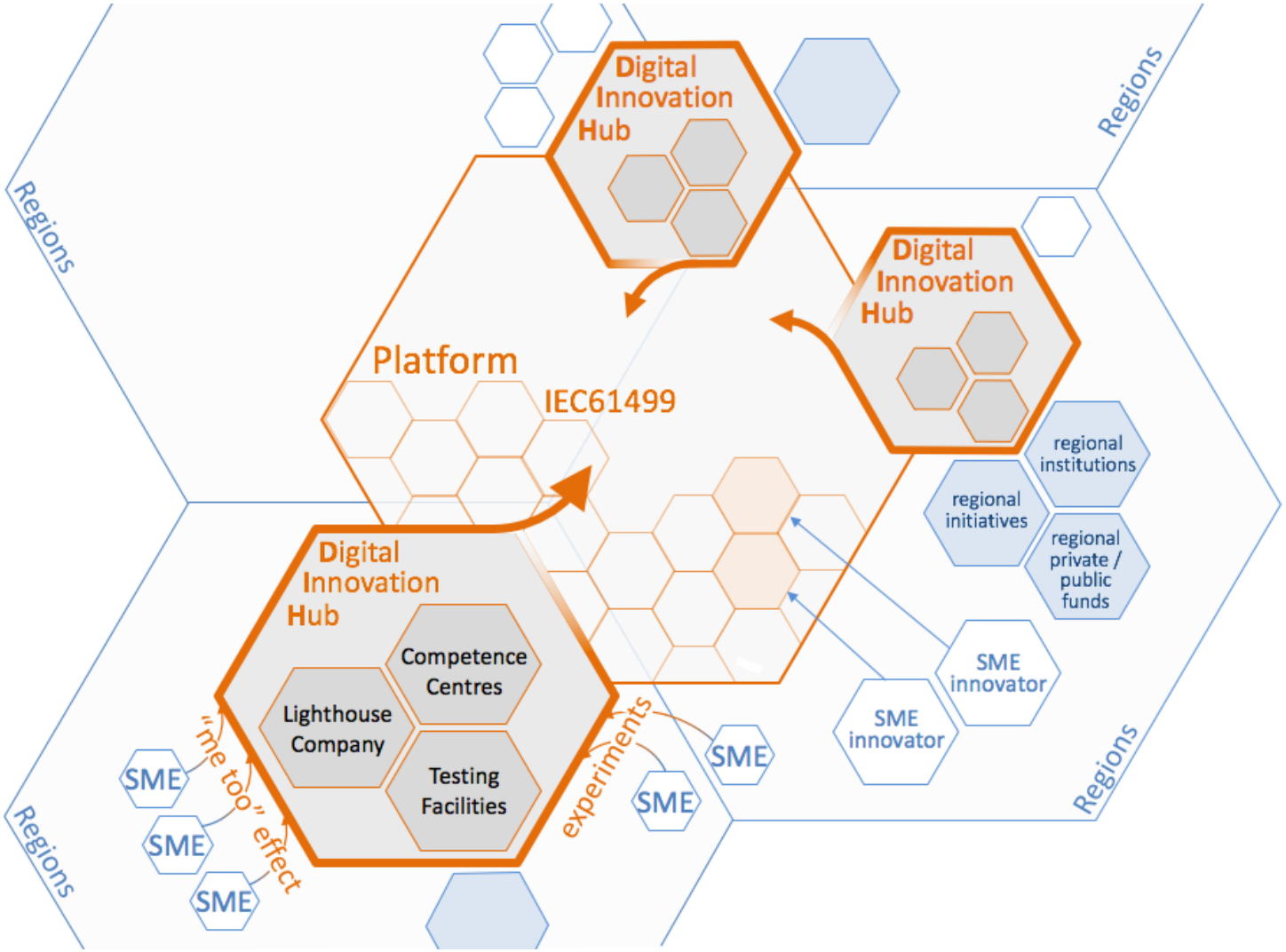


Education

Economy

A pan-European effort to involve the market

PLEIADES' approach to a market-driven but concerted effort



For further questions…

European Competence Centre

Synesis

IEC-61499

IEC 61499 Technology Group

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