# European Competence Centre for IEC-61499

*Building a digital platform to foster a European ecosystem for distributed automation.*

## *The need of Digital Platforms for industry at European level*

Current worldwide landscape is seeing continuously growing value creation from digitization, with digital technologies increasingly playing a central role for the entire economy. More and more types of products are seeing a progressive transition to the "digital inside" model, where innovation is mostly related to the extension of the product-model to the service-model, through a deeper integration of digital representations.

The future of Europe's industry must be digital, as clearly highlighted by Commissioner Oettinger EU-wide strategy to "ensure that all industrial sectors make the best use of new technologies and manage their transition towards higher value digitised products and processes" through the "Leadership in next generation open and interoperable digital platforms[1]", opening incredible opportunities for high-growth of vertical markets, especially for currently "non-digital" industries.

## *Daedalus initiative: exploiting Innovation opportunities for industrial automation*

Looking at how global competition in the manufacturing sector is becoming fiercer and fiercer, it is clear that European Manufacturing Companies have to focus their innovation efforts on new automation solutions that could grant to the shop floor systems the flexibility and re-configurability required to optimize their manufacturing processes.

In order to realize such a vision, current technological constraints must be surpassed through research and development activities focusing on the following topics: interoperability of data/information (versus compatibility) and robustness; integration of different temporal-decision scale data (real-time, near-time, anytime) and multiple data sources; integration of the real and the virtual data-information towards a predictive model for manufacturing; real-time data collection, analysis, decision, enforcement; optimisation in complex system of systems infrastructures; seamless data integration across the process value chain; standardization and interoperability of manufacturing assets components, sub systems and services.

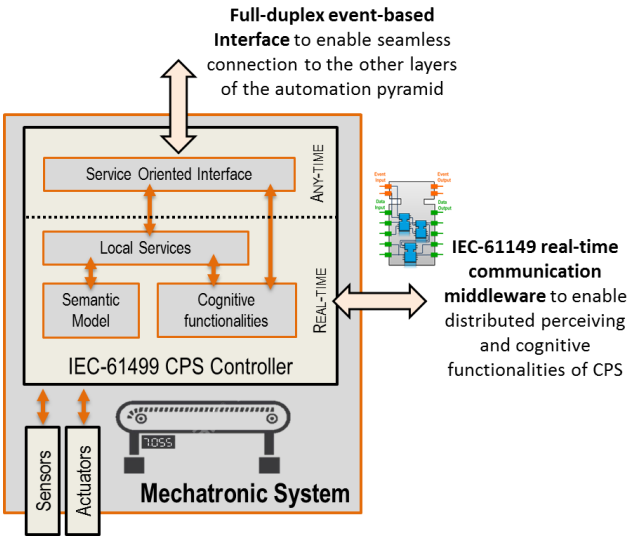
Daedalus initiative has been conceived thanks to the awareness that purely technological advancements are not enough to satisfy the need of innovation of the industrial automation market. New methodologies for the sector's main stakeholders to solve the new manufacturing needs of end-users must be conceived and supported by the creation of a technological and economic ecosystem built on top of a multi-sided platform.

[1] https://ec.europa.eu/digital-agenda/en/digitising-european-industry

*IEC-61499 technological platform for interoperable real-time orchestration of distributed intelligent devices*

The core conceptual idea launched at European level by the German "Industrie 4.0" initiative is that embedding intelligence into computational systems distributed throughout the factory should enable vertical networking with business process at management level, and horizontal connection among dispersed value networks.

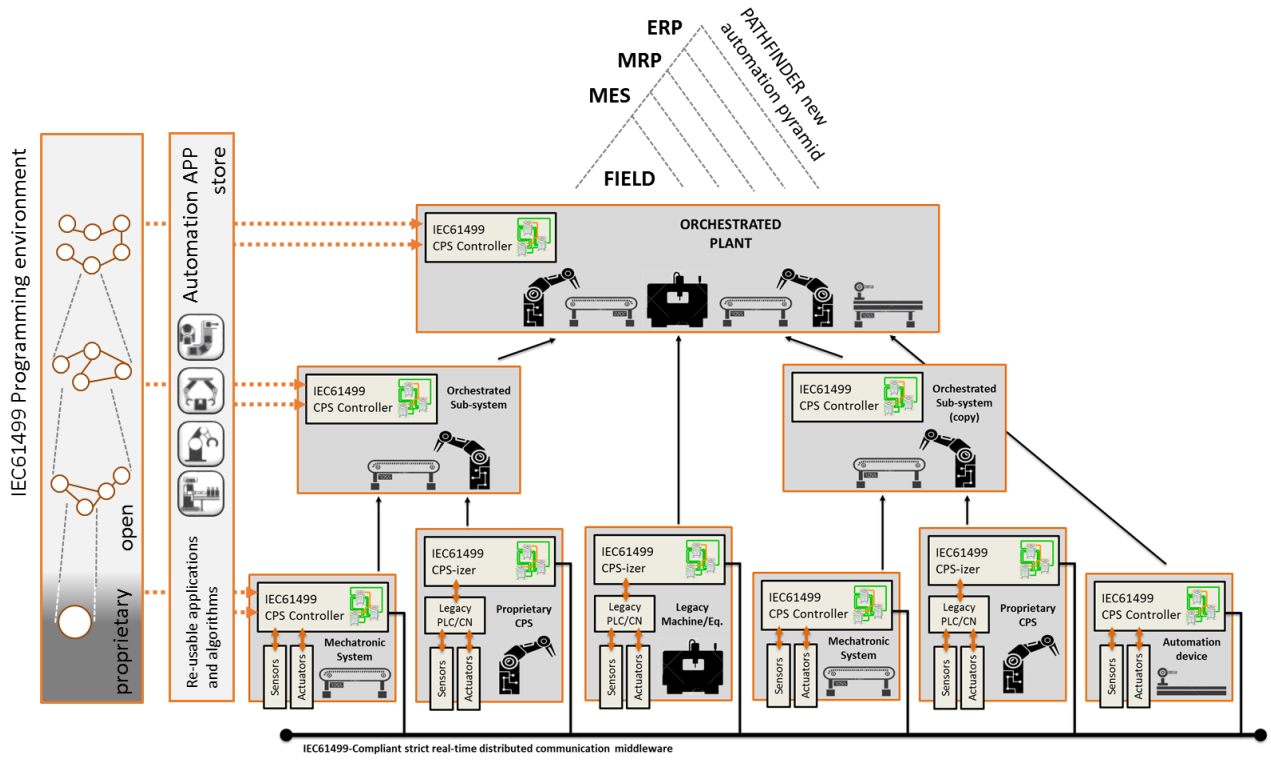
Overstepping the constraints of current PLC technology and IEC-61131 standard, Daedalus exploits the already existing features of the IEC-61499 international standard for distributed automation to propose a functional model for CPS that blends coherently real-time coordination of its automation tasks with the "anytime" provision of services to other elements of the automation pyramid. This extension of the IEC-61499 functionalities adopts the openness and interoperability of implementation that the standard proposes, guaranteeing that CPS developed independently will be able to communicate and be orchestrated.




Providing automation devices as IEC61499-compliant CPS is just the enabler for the cornerstone of the project. In fact, the real complexity of future shop floor (and, thus, the opportunities for new manufacturing paradigms) resides in the possibility to develop easily the multi-level orchestration intelligence needed to coordinate the behaviour of all the CPS composing a shop floor.

The project adoption of IEC-61499 presents automatically the solution to this issue, with an industry-ready approach (validated in several production environments) that already satisfies the major needs for engineering complex orchestrating applications: interoperability between devices, real-time communication between distributed systems, hardware abstraction, automatic management of low-level variable binding between CPS, a modern development language (and environment), etc. This set of functionalities just needs to be "completed" with additional ones that will make it the undisputed standard at European level.

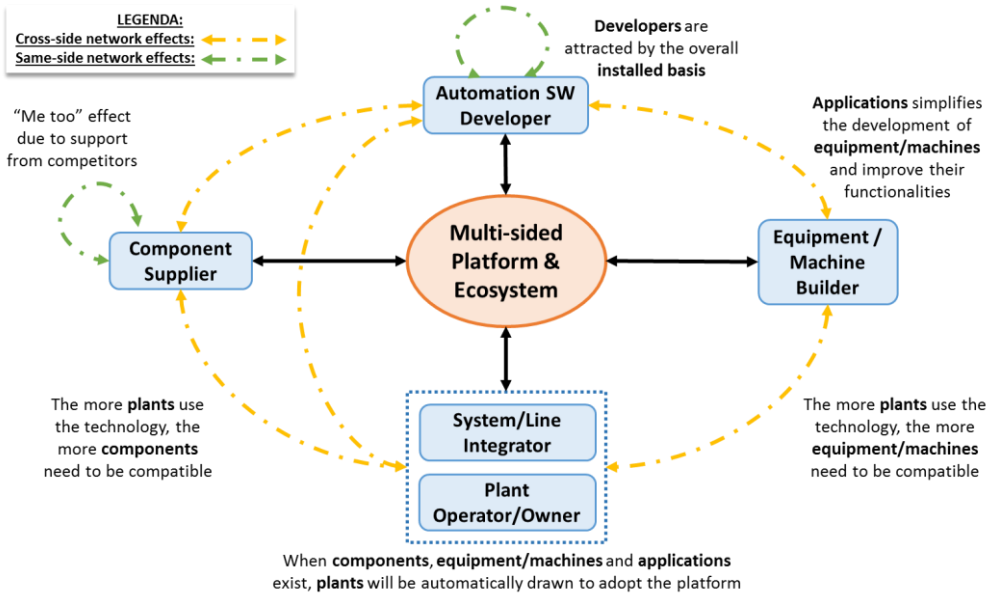
Adopting IEC-61499 standard and the corresponding development language brings the engineering of automation CPS to the same level of technical opportunities that already characterize current IT world, with modularity, aggregation, inheritance, etc. finally becoming tools of the automation engineer. Future shop floors application development will be based on a much more distributed and concerted effort among the different stakeholders of this market, paving the way for a digital marketplace.




*Industrial automation market as a multi-sided ecosystem*

Having a look in general to the industrial automation market in Europe, today the structure is approximately composed by large companies producing both hardware and software automation solution for integrated production systems (Siemens, ABB, etc.), large and medium companies supplying PC-based automation solutions (Beckhoff, B&R, etc.) and a remaining share covered by a multitude of SMEs, mainly system integrators. On top of that, most industrial automation systems are sold through distribution, and hence through a fairly disaggregated channel, requiring then integration by a third party systems integrator.

Thanks to technological innovations that finally unleash all the potential of a de-centralized but orchestrated architecture of CPS, Daedalus brings together the distinct but interdependent groups of Complementors of the industrial automation domain into a Digital Business Platform that creates value by facilitating interactions among them, fostering the growth of a multi-sided Ecosystem.

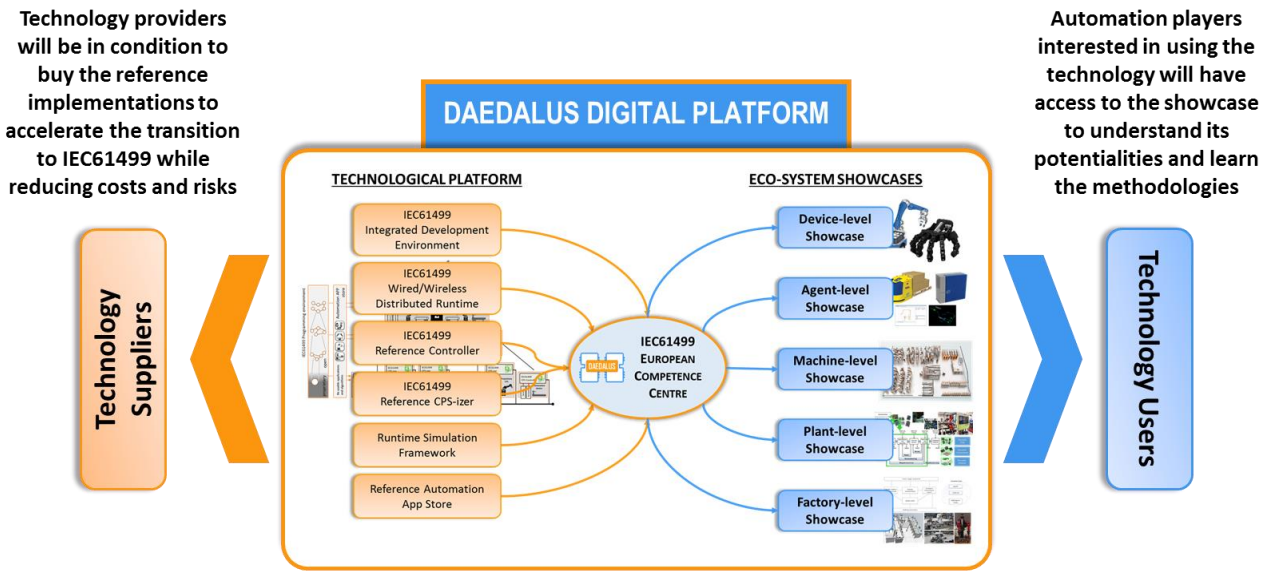


*Competence Centre and Showcase: incubation, beta-testing and kick-off of Daedalus Ecosystem*

As seen, the industrial automation sector is dominated by two major trends: big vertical companies have maintained their market share by proposing proprietary technologies that lock users into their product portfolio; a fairly disaggregated value chain for the deployment of final solutions at the end-user plants has caused a quite low software culture among system integrators. These two factors, together with the reluctance of plant operators/owners towards innovation, have caused an overall reticence of the industrial automation world in accepting earlier advanced software technologies coming from the ICT domain.

Today, the push by competition from eastern countries and the need to have manufacturing systems much more flexible and reconfigurable in face of the market volatility have drawn the attention towards the CPS concept, but assuring the success of concepts such as those proposed by Daedalus Initiative is not just a matter of their technical value.

Understanding and accepting the major issue in deploying a Digital Marketplace for a multisided ecosystem – attracting users into the platform – Daedalus' answer is the creation of a European Competence Centre to push the envelope of IEC61499-based CPS as a disruptive innovation and become the catalyser to accelerate a widespread acceptance of the project platform at European level, hosting and incubating its Digital Marketplace.




As Competence Centre for IEC-61499 automation platform, Synesis will have a three-fold role:

1. Hosting the technologies developed during Daedalus in a reference implementation that will demonstrate the effectiveness of the platform;
2. Supporting the deployment of multiple showcases of the technology, in order to bring to the market concrete examples of how it can be used;
3. Incubating the Multi-Sided Platform and the corresponding Digital Marketplace, while providing advanced services to Technology suppliers and Technology users in order to guarantee wide acceptance of Daedalus concepts.

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