

AML Mechatronic Models as Enabler of Automation Systems Engineering: Tool Suite and Workflow

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AutomationML user conference

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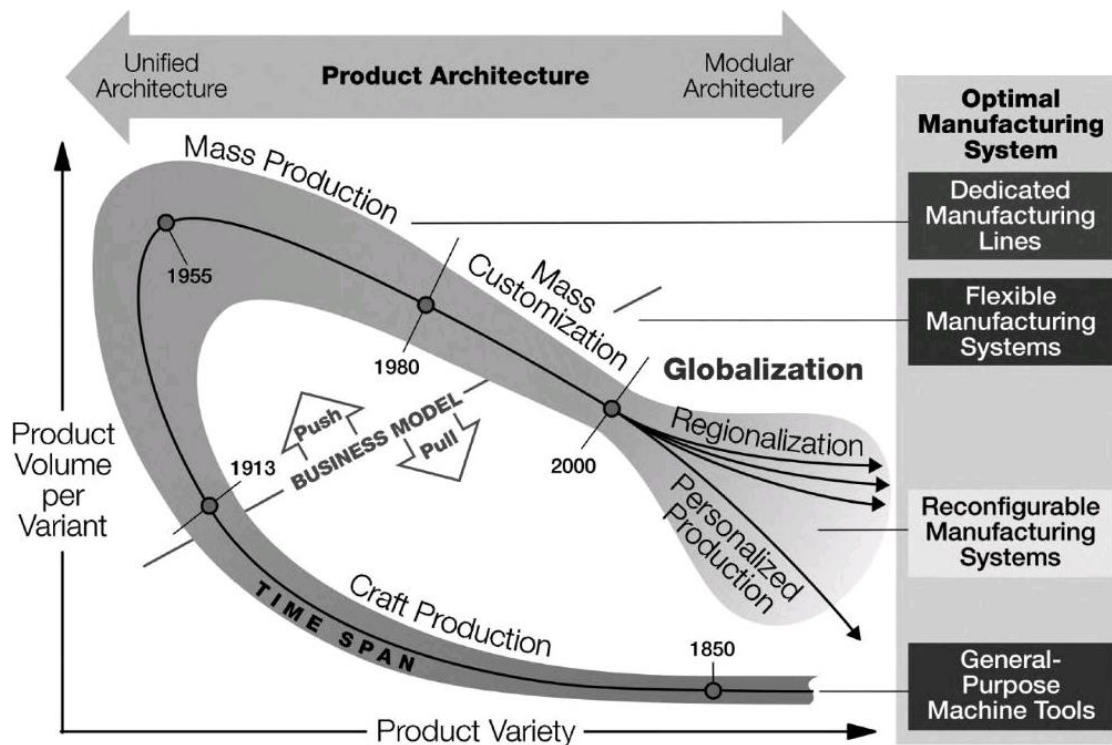
ABB, Sweden



Devekos: Background



Customer (Product) focused manufacturing systems



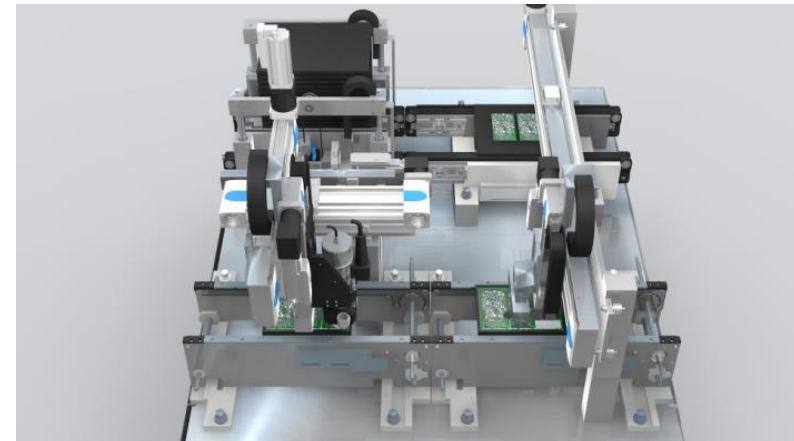
Source: Yoram Koren, The Global Manufacturing Revolution, 2010

- Objective: Enable personalized production with automated manufacturing facilities composed of distributed, networked systems, providing component level
 - Modularity, reusability
 - Variant management
 - Adaptation and reconfiguration
- Changes required in manufacturing facility
 - Reconfigurability of production systems
 - Lot size ~1
 - Intuitive plant engineering, re-engineering, operation and maintenance
 - Vertical & horizontal integration

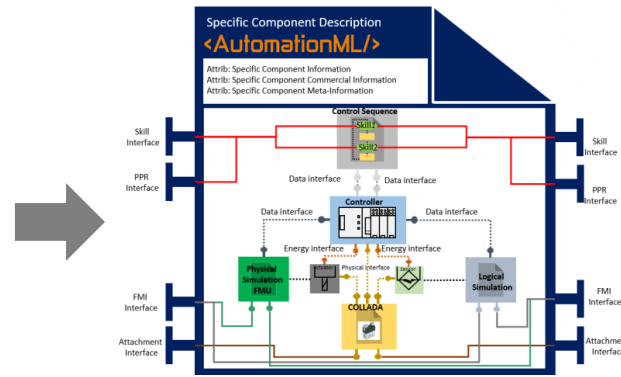
Scope and requirements



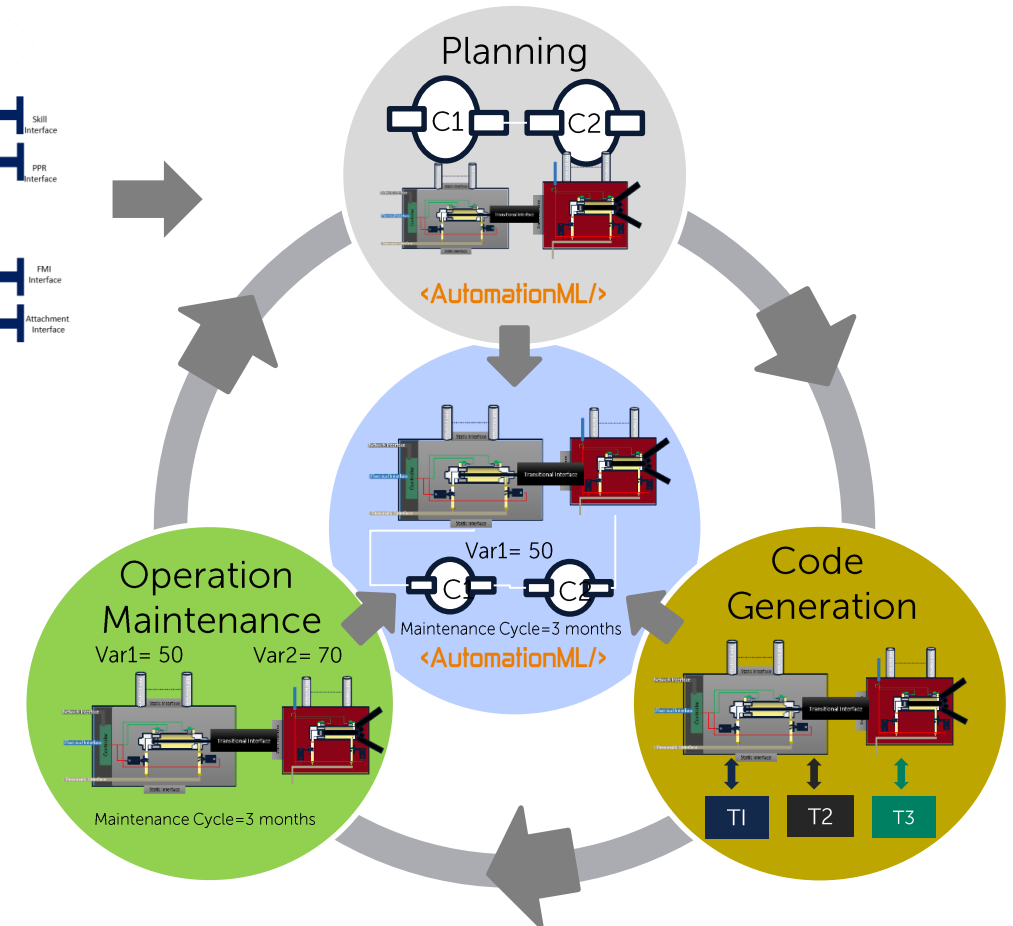
- Scope: To develop an intuitive engineering process supporting seamless integration of multi vendor components
- Requirements:
 - Means to model automation systems considering modularity, reusability and interoperability
 - Methodology and tool support for automation systems engineering and re-engineering



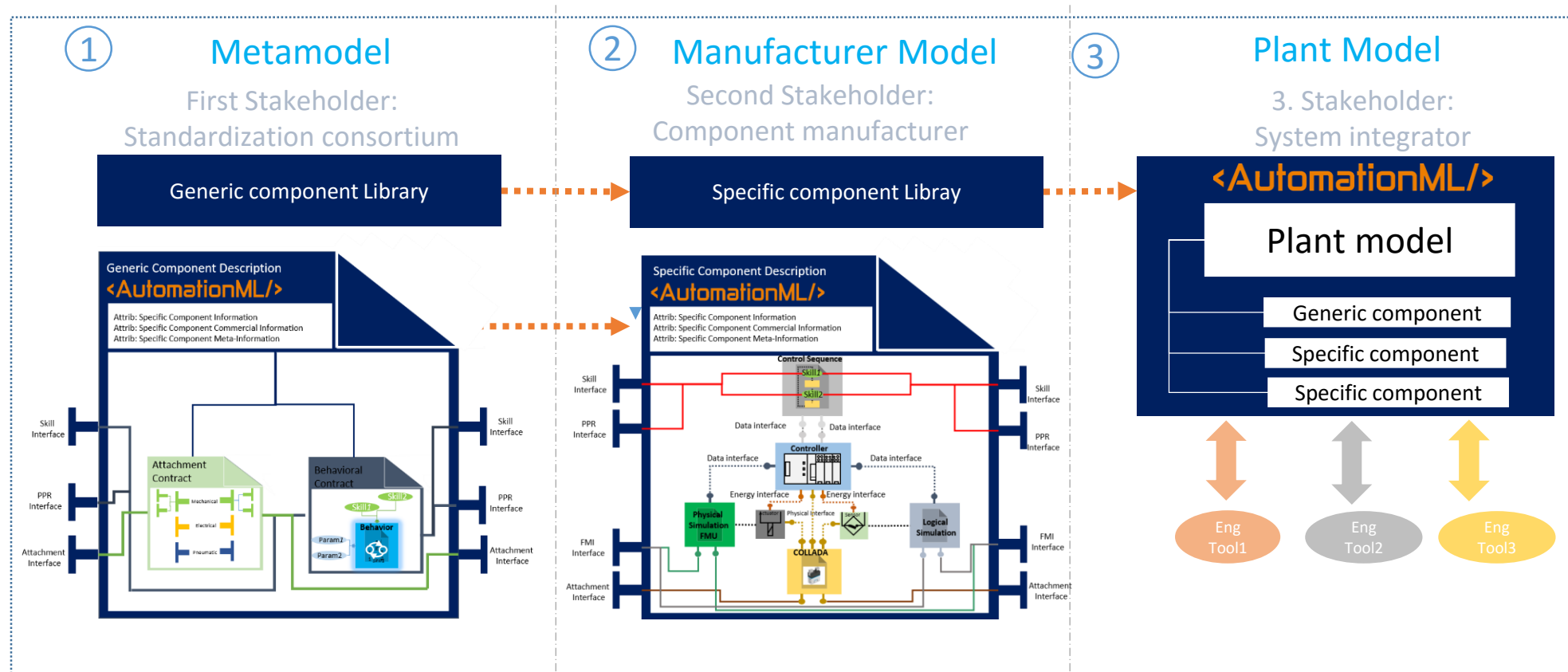
Envisioned automation systems engineering using AML mechatronic models



- Component manufactures publish component models built in AutomationML, through their website
- System integrators can plan their systems using an AutomationML metamodel consisting component models
- Engineering data can be automatically generated in different discipline specific tools from the planning data
- Any changes in the system are communicated through an AutomationML data bank



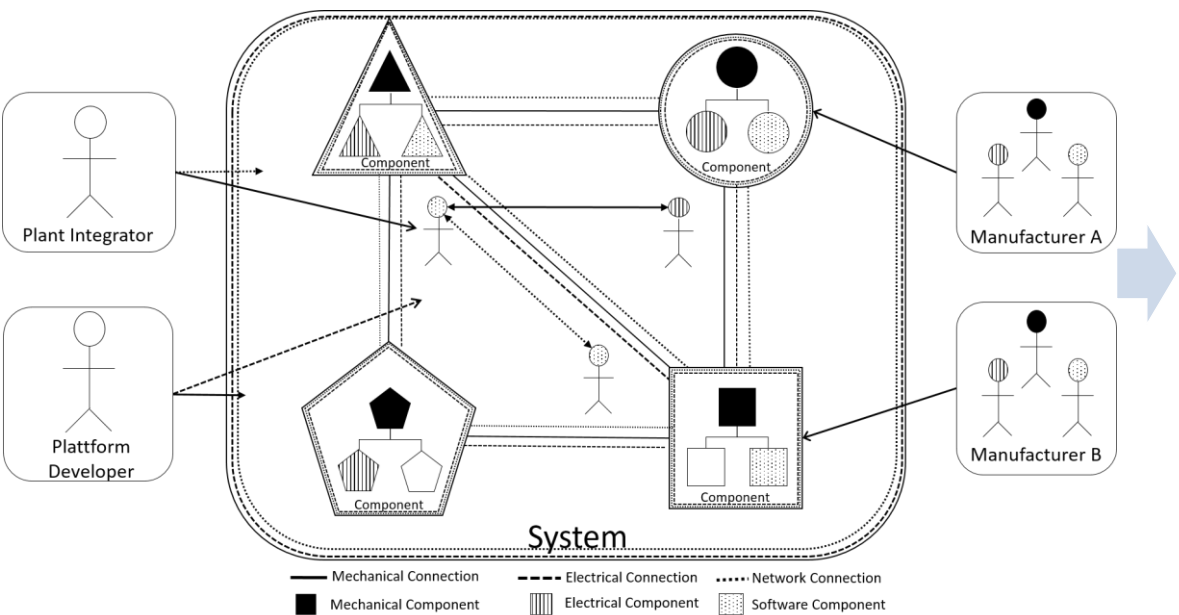
Enabling interoperability of component models with standardization



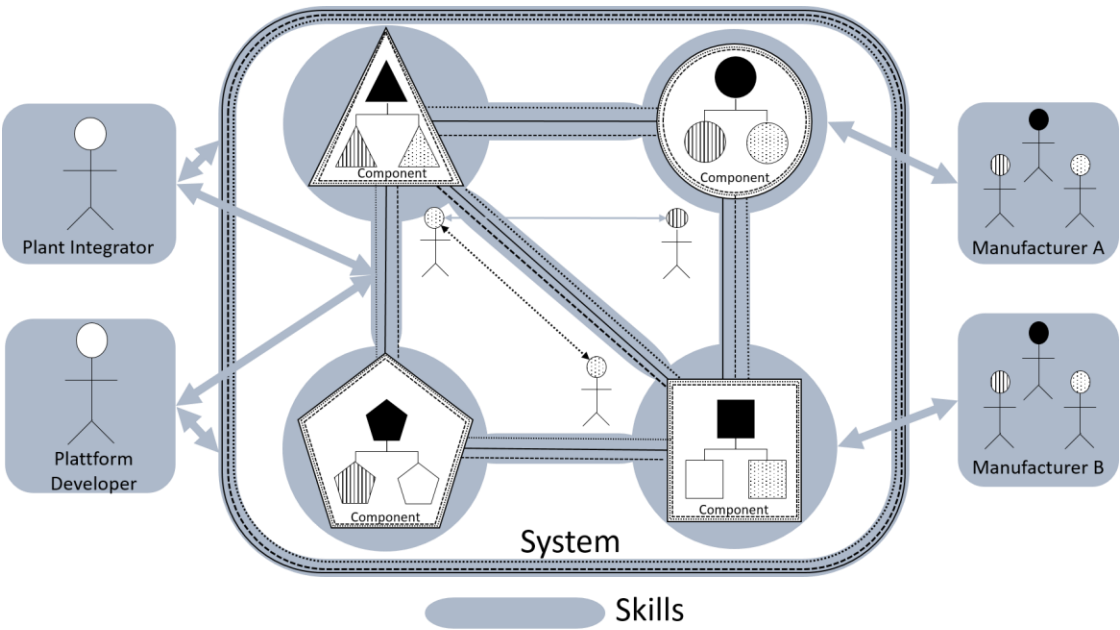
Using unified interfaces to components in the form of skills



System engineering without skills



System engineering with skills



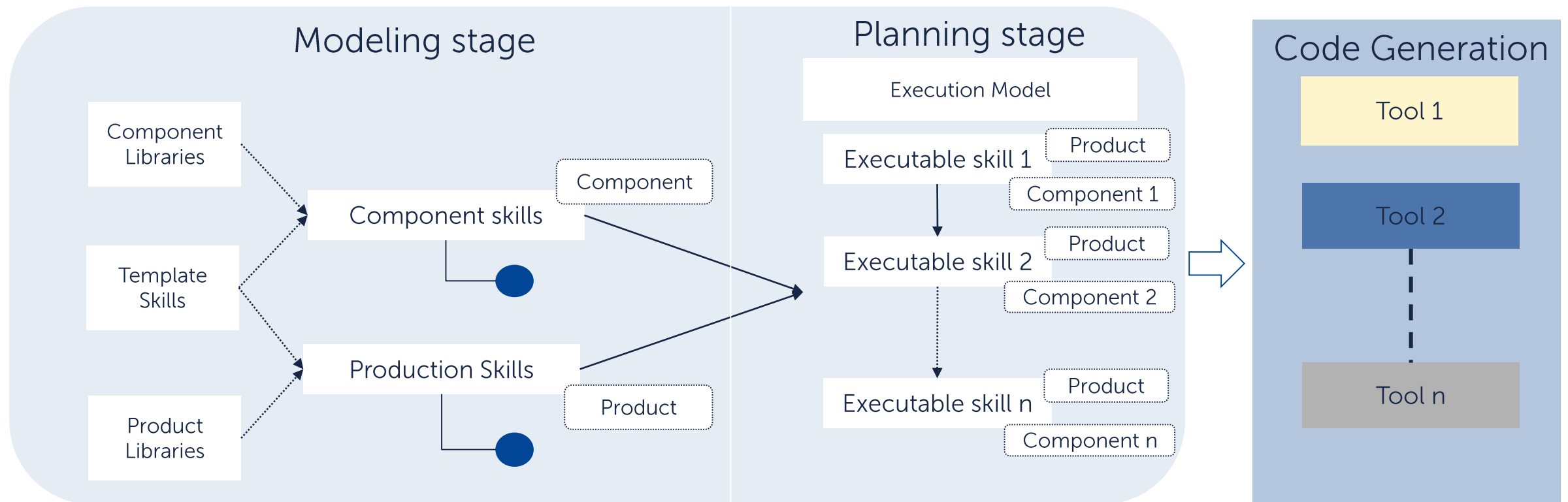
Individual disciplinary engineering and interfacing required for each components

Unified interfaces to a system in the form of skills; complex components encapsulated with skills

Implementation approach

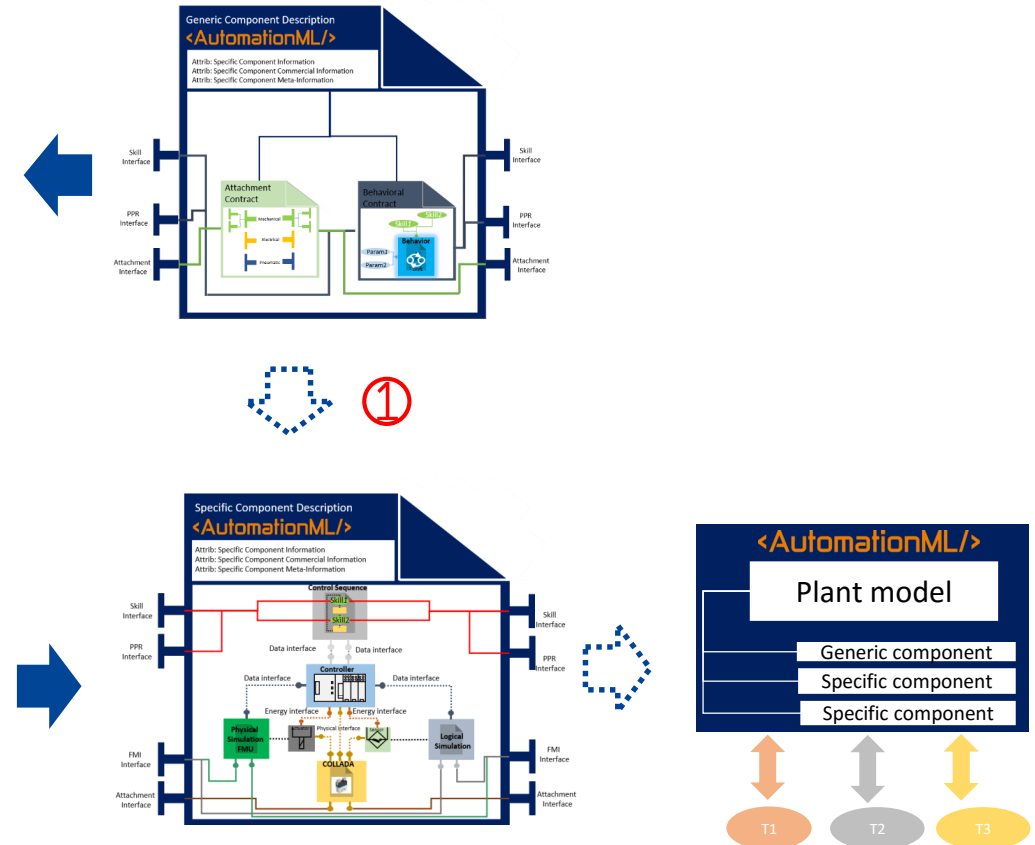
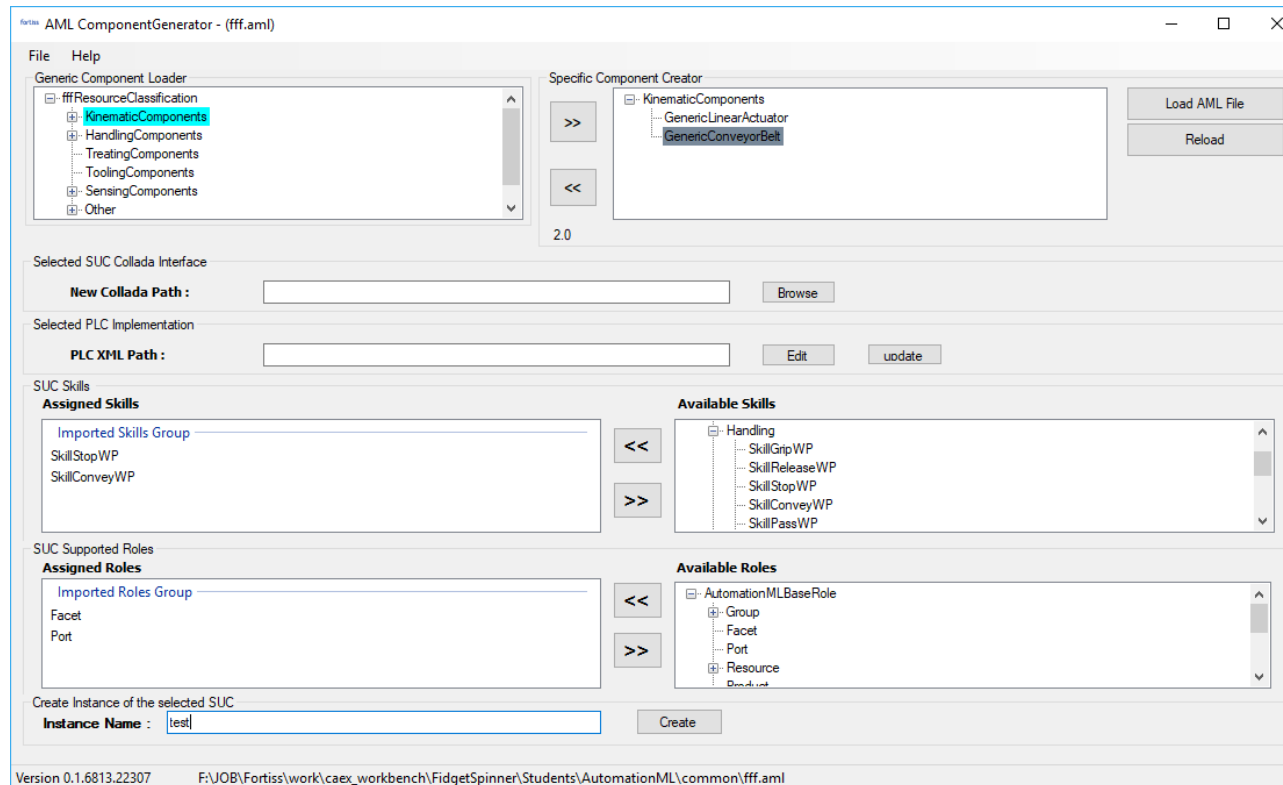


Systems engineering process using AutomationML metamodel



Inspired from: Schleipen, M., Pfrommer, J., Aleksandrov, K., Stogl, D., Escalda, S., Beyerer, J., & Hein, B. (2014). Automationml to describe skills of production plants based on the ppr concept. In *3rd AutomationML user conference*.

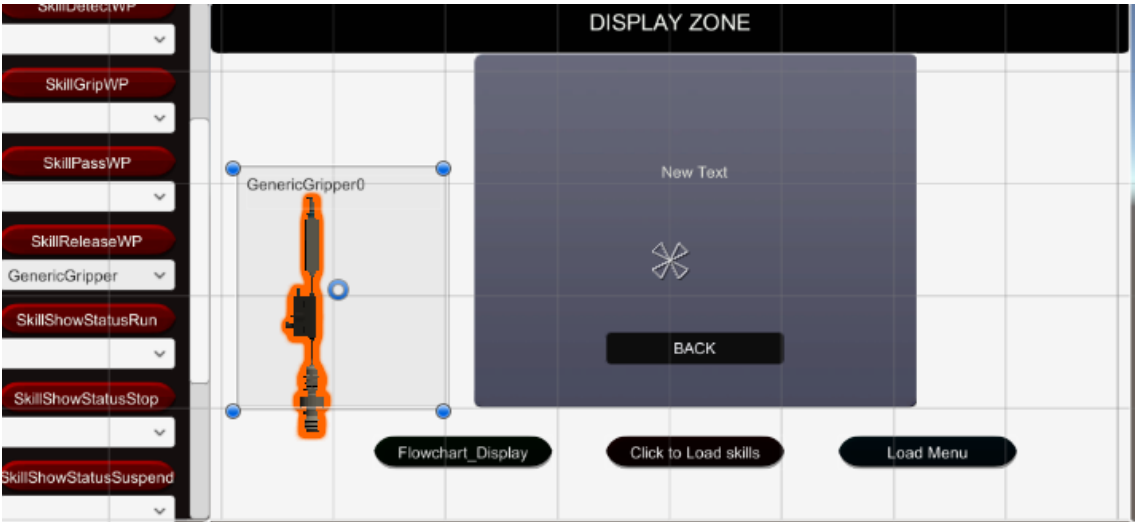
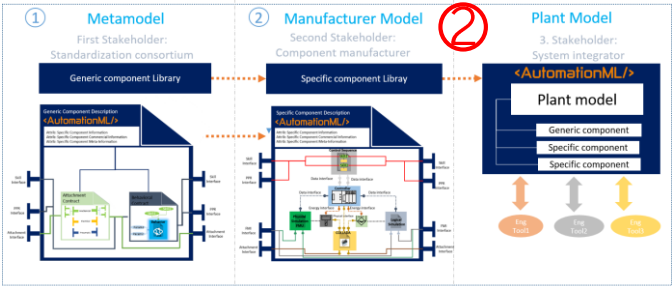
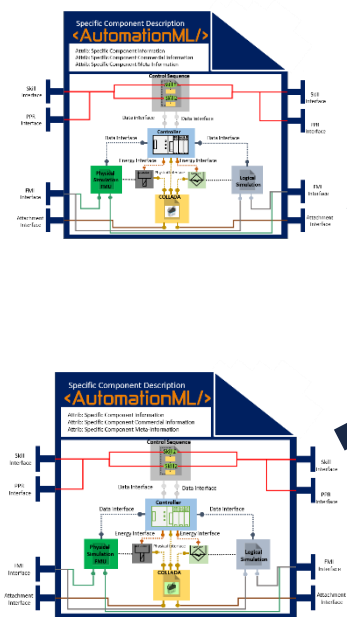
Tool support: Component generator



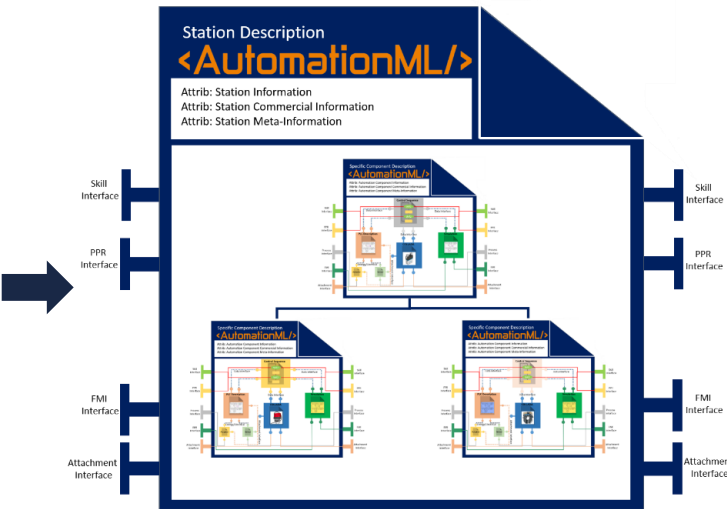
Tool support: Mechatronic system composer



AML Component library Import



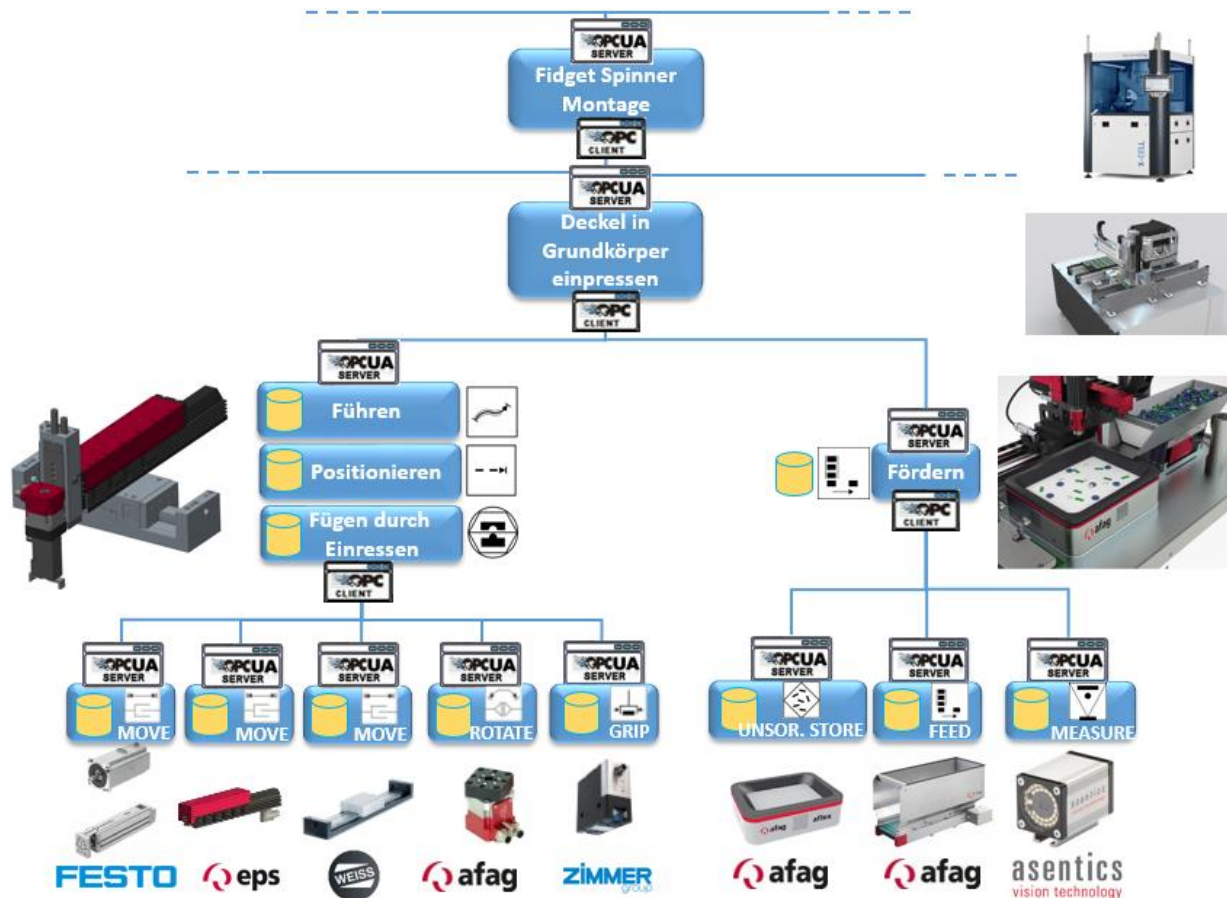
AML plant hierarchy export



Usecase scenario



VDMA demonstrator, Automatica 2018, Munich

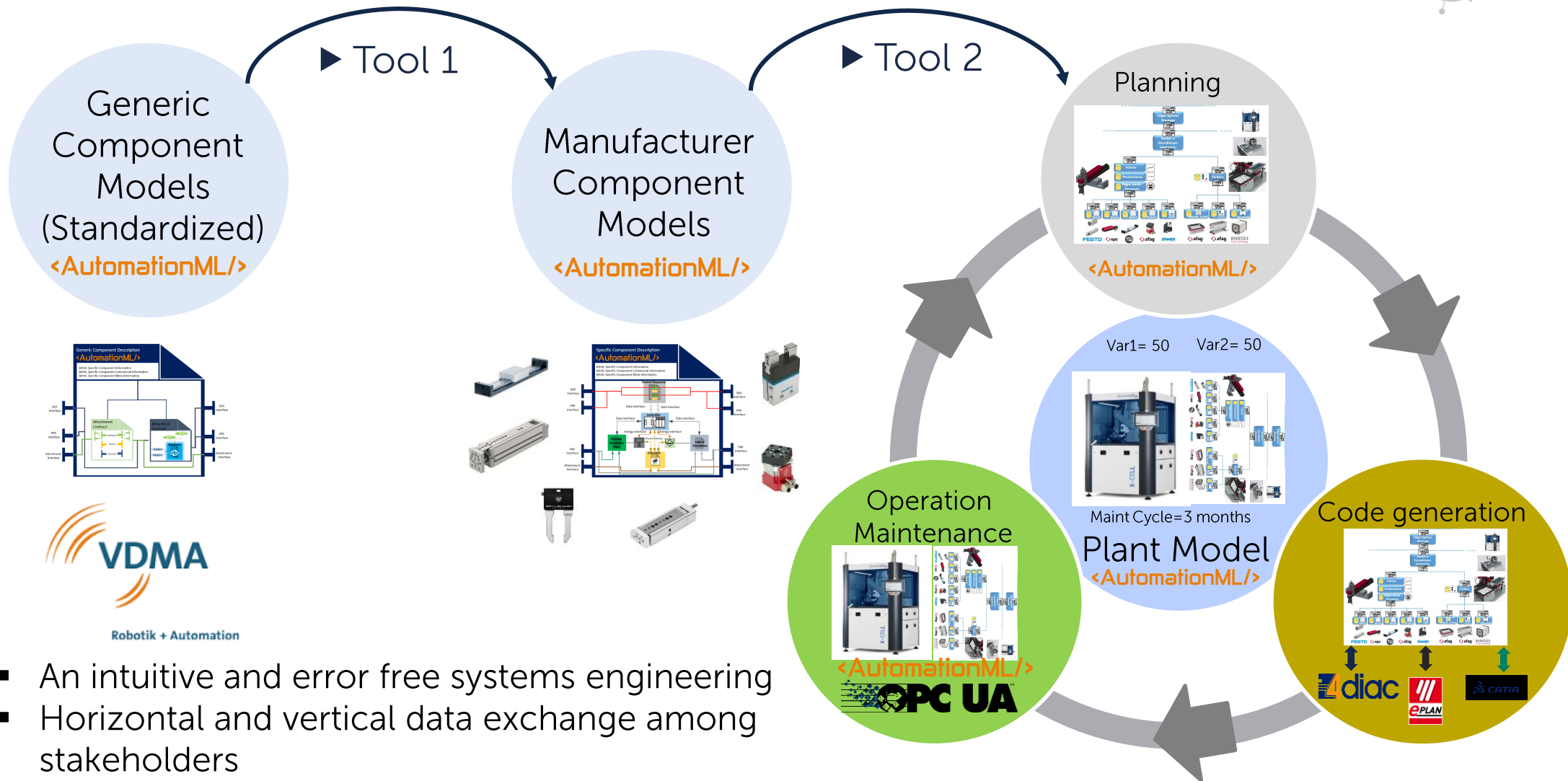


Methodology

- Enabling interoperability using OPC UA in individual components and layers
- Encapsulating mechatronic complexity by skill based engineering



Conclusion and future works



- An intuitive and error free systems engineering
- Horizontal and vertical data exchange among stakeholders

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