An minimal tool interface for machinery and equipment engineering

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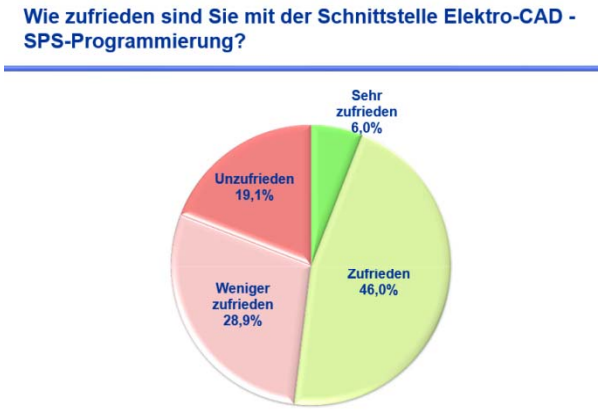
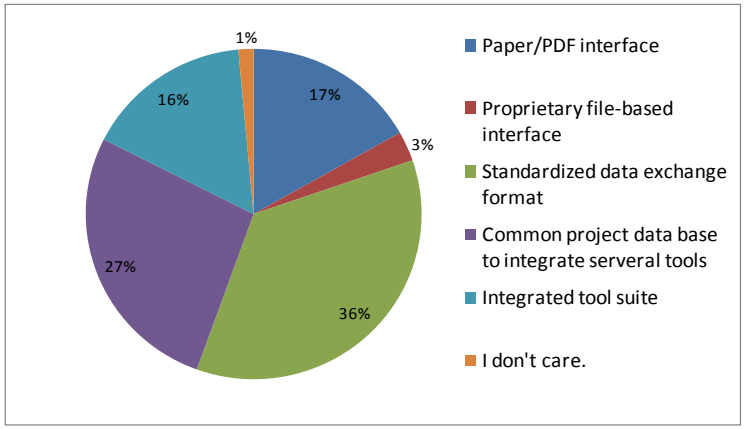
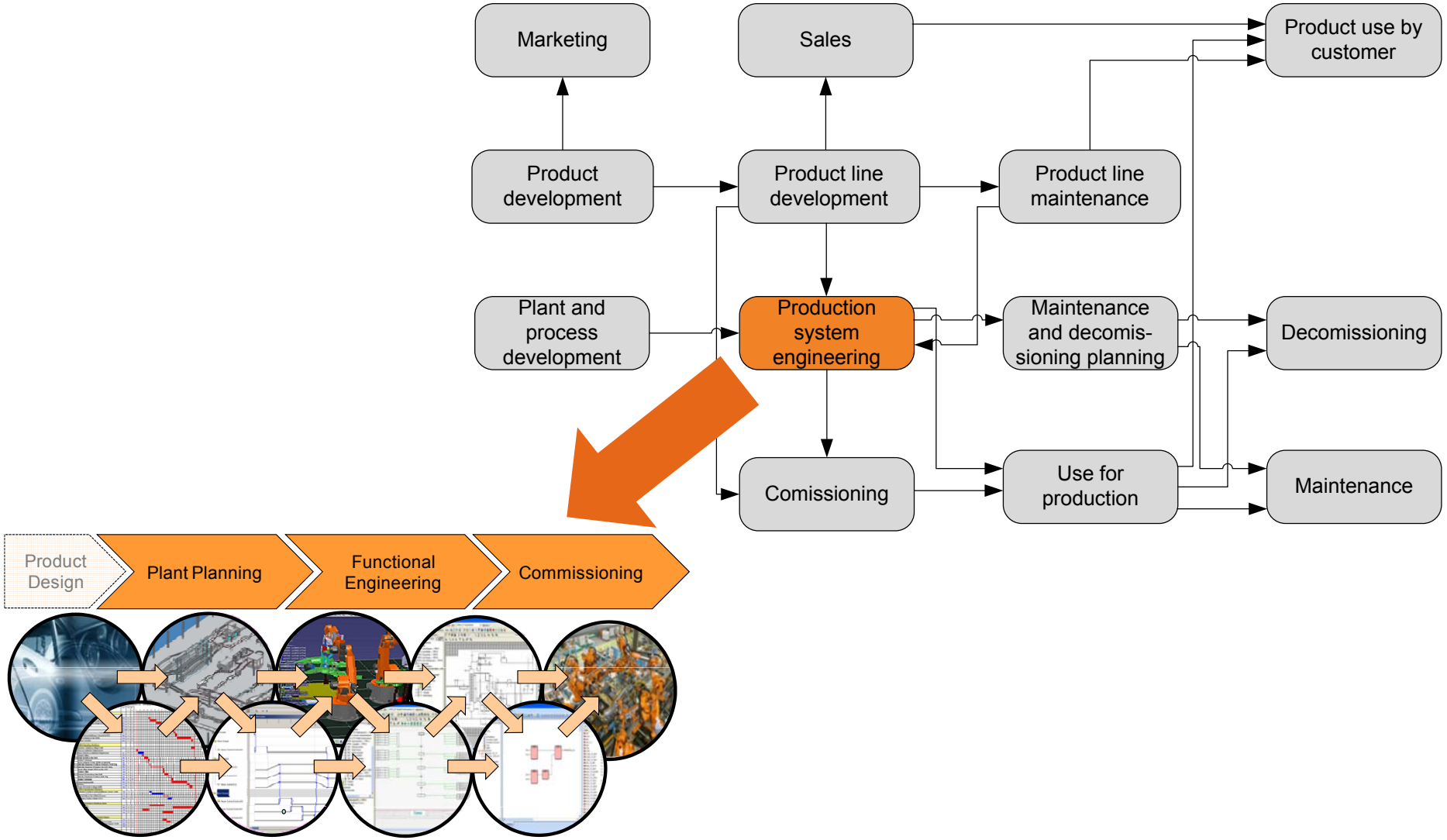
- **Engineering of production systems**
  - **Is a complex process requiring the involvement of several engineering disciplines**
  - **Exploits engineering tools optimized to the needs of the engineering activities**
- **The engineering tool chain is one of the key factors for future economical success.**



Source: Marktstudie Engineering-Prozess: Mechanik – Elektronik – Software, http://www.marktstudien.org 2012

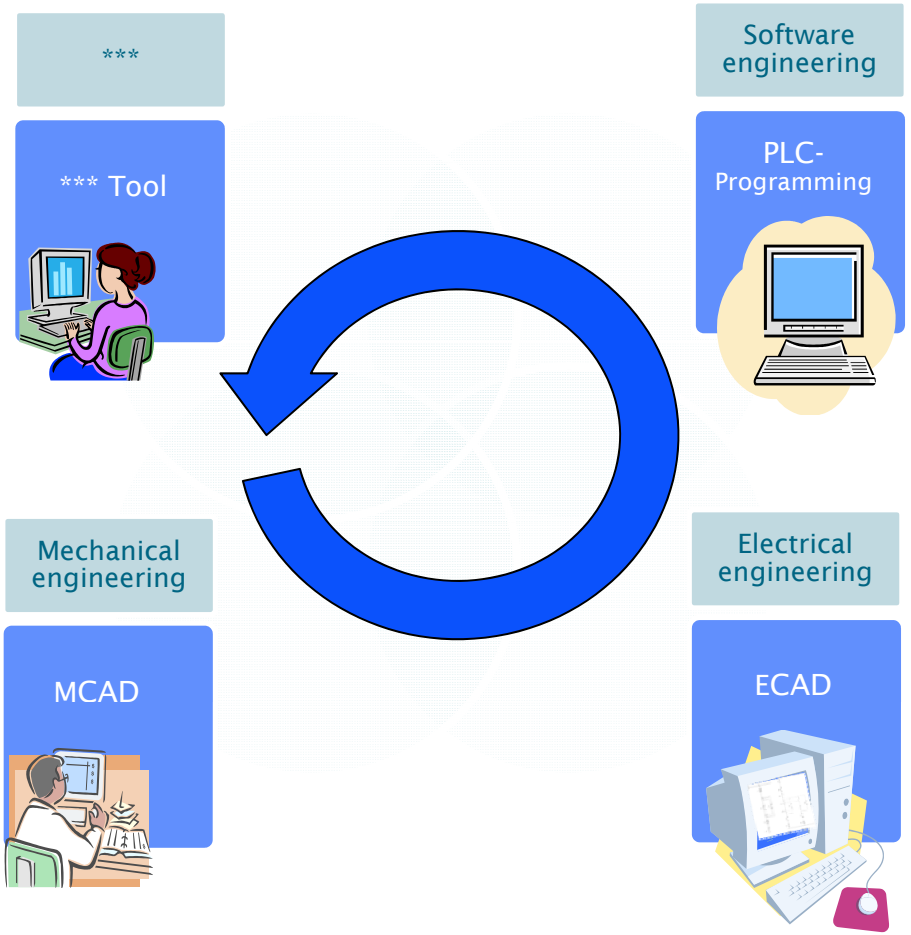


Source: Expectations of practitioners to data exchange technologies, OvGU 2014

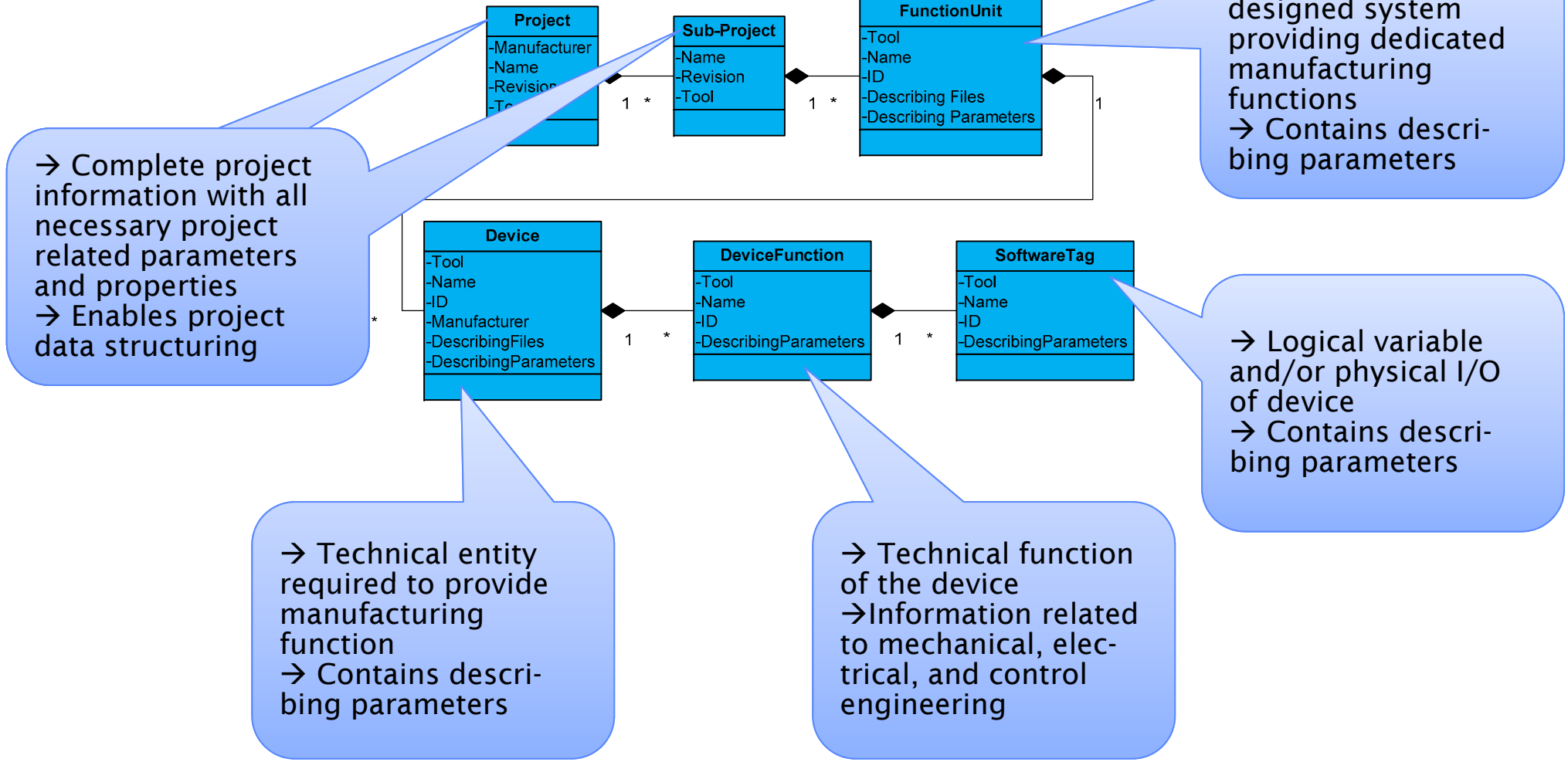

Marketing
Sales
Product use by customer
Product development
Product line development
Product line maintenance
Plant and process development
Production system engineering
Maintenance and decomis-sioning planning
Decomissioning
Comissioning
Use for production
Maintenance
Product Design
Plant Planning
Functional Engineering
Commissioning

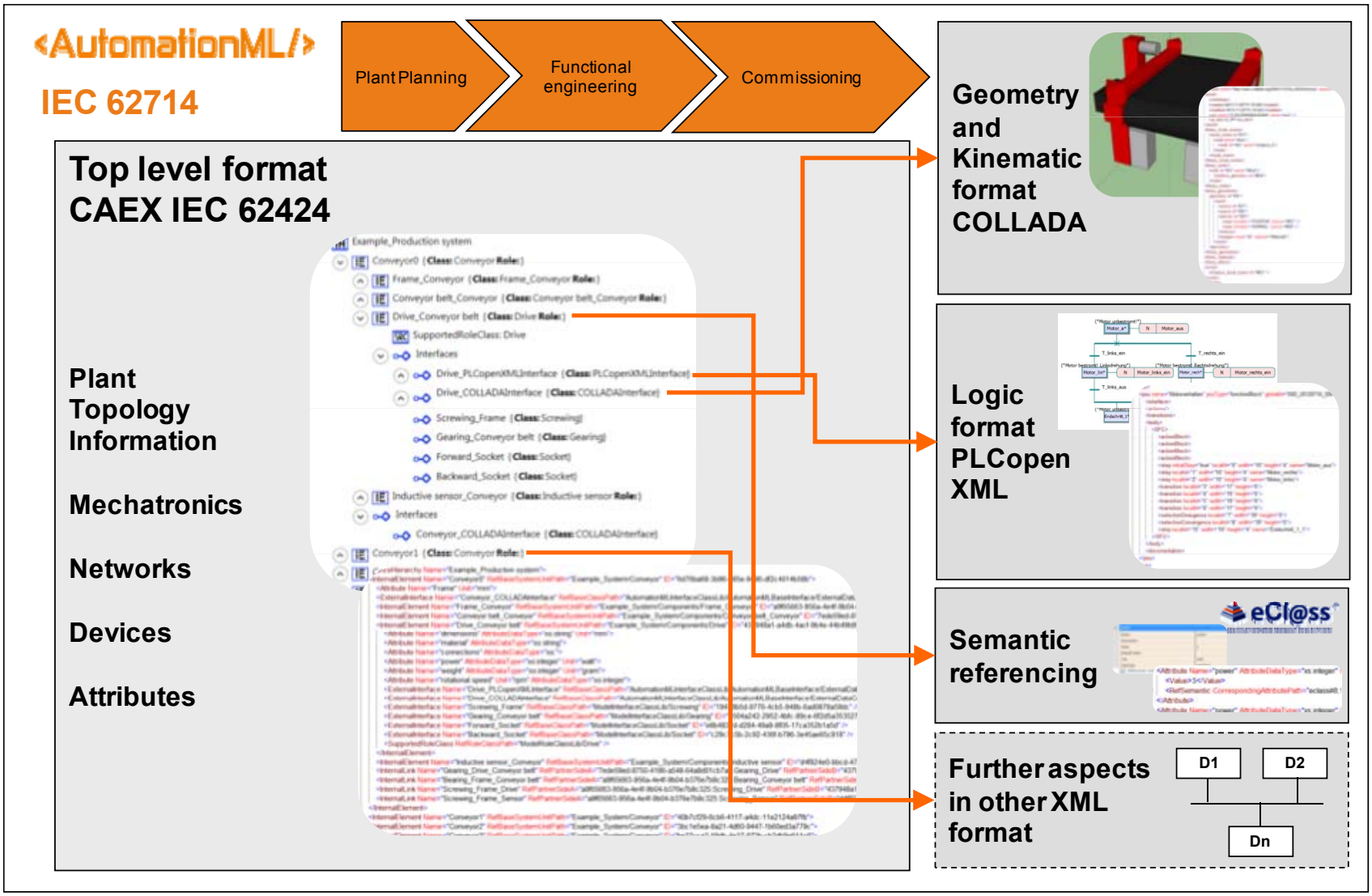
- **But the weapons for tool chain design are not equally distributed:**
  - **Large enterprises are able to**
    - **Send staff to standardization organizations**
    - **Order tool extensions specially designed for their purposes**
    - **➔Impact the activities of tool developers and standardisation organisations**
  - **Small and medium enterprises do not have this possibilities**
- **Point of action for lobby organizations**
  - **VDMA working group „Engineering-Schnittstellen“**
    - **Integrates practitioners from production system engineering, tool vendors, and academia to consensually**
    - **Aims:**
      - **identify the tool chain of interest,**
      - **develop a common data model for all data to be exchanged between tools and which are relevant in an engineering project, and**
      - **specify a data representation within a data exchange format.**

- **Intended tool chain**

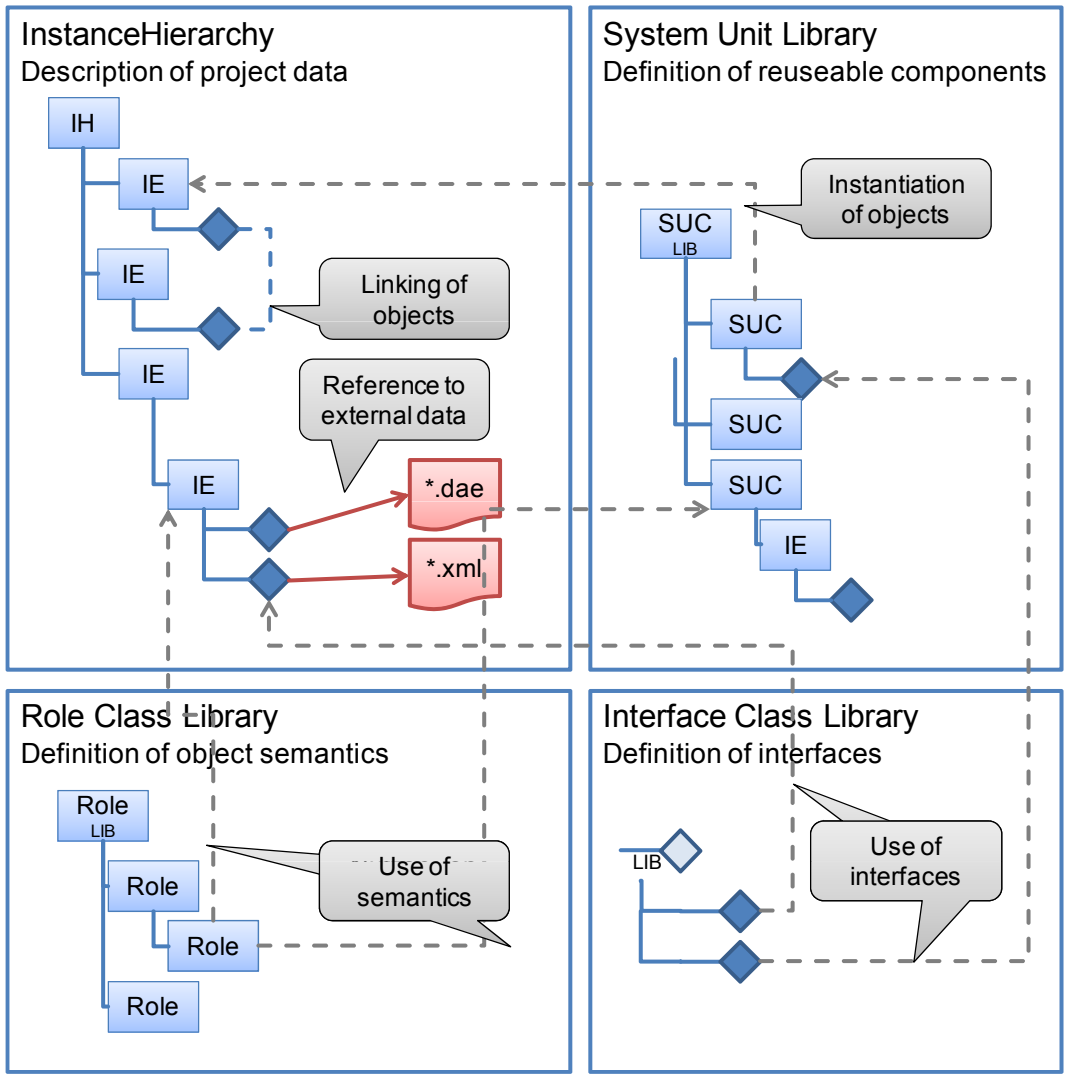


Data model

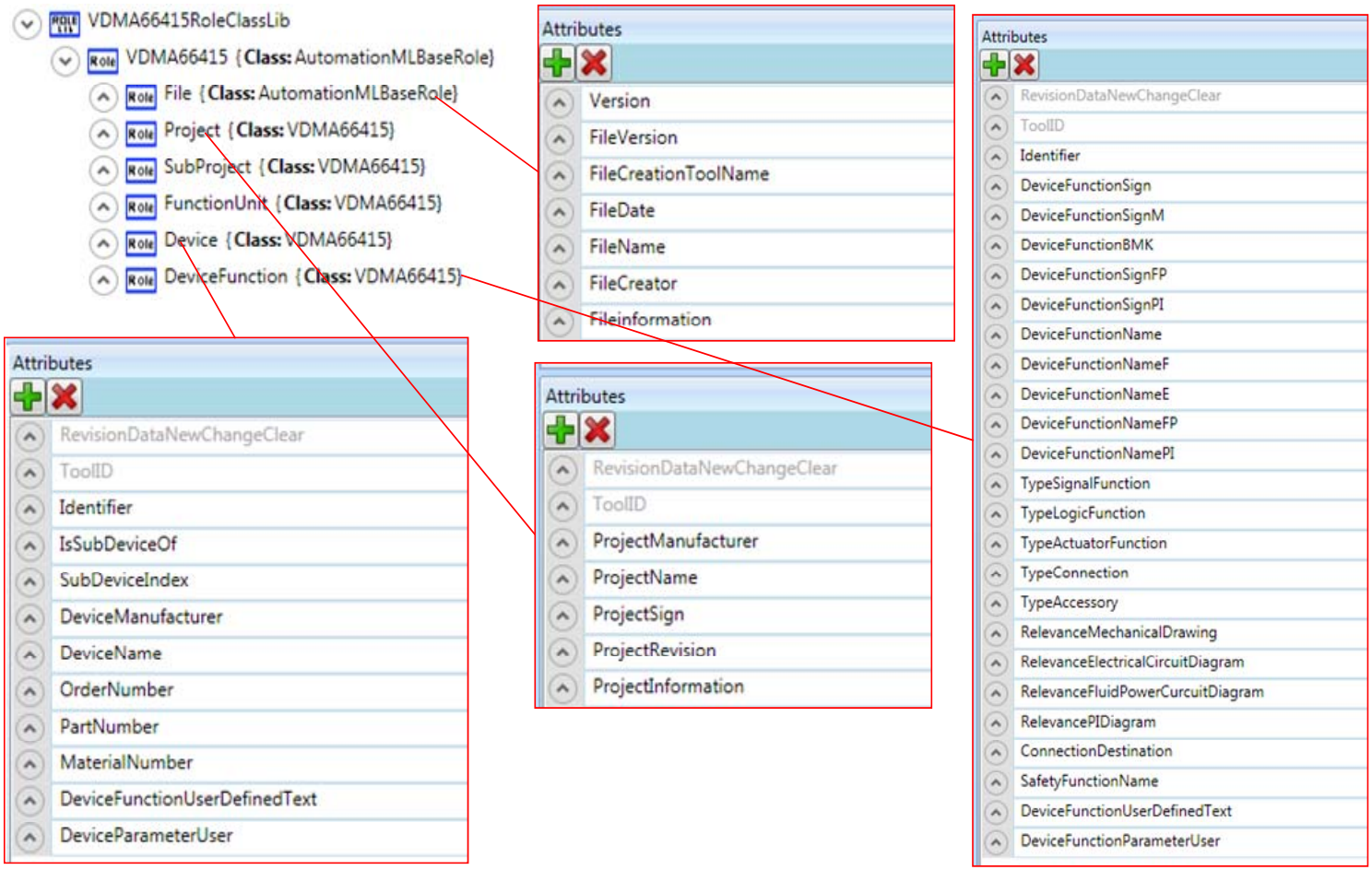

Project
-Manufacturer
-Name
-Revision
-Tool
Sub-Project
-Name
-Revision
-Tool
FunctionUnit
-Tool
-Name
-ID
-Describing Files
-Describing Parameters
Device
-Tool
-Name
-ID
-Manufacturer
-DescribingFiles
-DescribingParameters
DeviceFunction
-Tool
-Name
-ID
-DescribingParameters
SoftwareTag
-Tool
-Name
-ID
-DescribingParameters
1
*
→ Complete project information with all necessary project related parameters and properties
→ Enables project data structuring
→ Part of the designed system providing dedicated manufacturing functions
→ Contains describing parameters
→ Technical entity required to provide manufacturing function
→ Contains describing parameters
→ Technical function of the device
→Information related to mechanical, electrical, and control engineering
→ Logical variable and/or physical I/O of device
→ Contains describing parameters



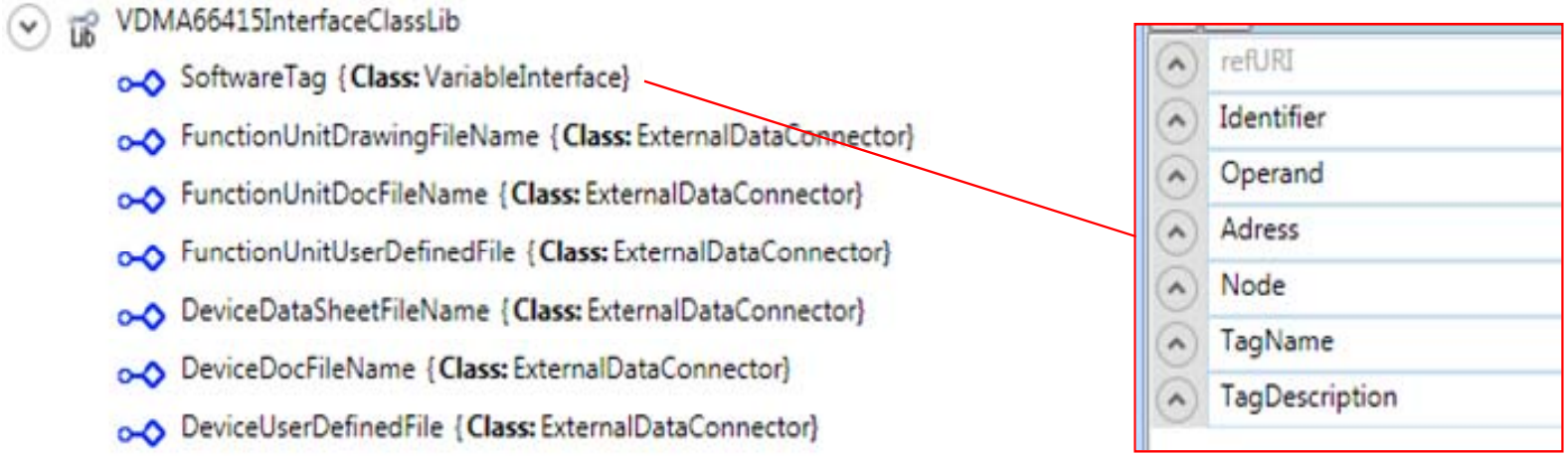
AutomationML General architecture


InstanceHierarchy
Description of project data
IH
IE
IE
IE
IE
Linking of objects
Reference to external data
*.dae
*.xml
System Unit Library
Definition of reuseable components
Instantiation of objects
SUC
LIB
SUC
SUC
SUC
IE
Role Class Library
Definition of object semantics
Role
LIB
Role
Role
Role
Use of semantics
Interface Class Library
Definition of interfaces
LIB
Use of interfaces

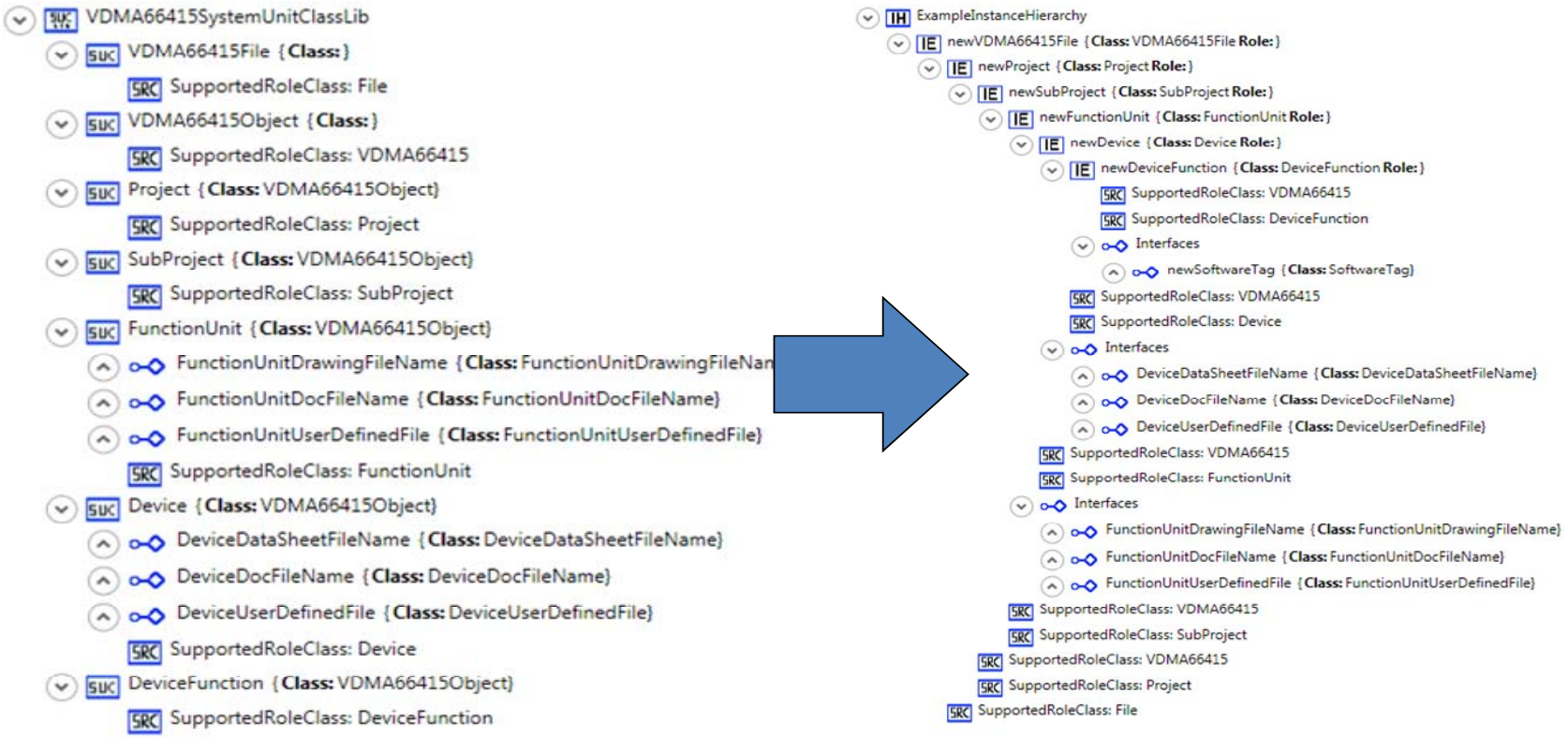
Role class library



- **Interface class library**



System unit class library and instance hierarchy



AutomationML representation of VDMA data model

- **Defined structure maps all information modeled in the VDMA data model to AutomationML modeling elements**
- **Benefits:**
  - **Changes in the VDMA data model require only the update of related role classes and interface classes. It is not necessary to change the implementation of tool interfaces.**
  - **Tool vendors only have to develop one interface which will be adapted to different application cases.**
  - **Tool users can apply additional AutomationML based features for data exchange like eCl@ss integration or OPC UA integration.**

- **Presented structures and relations are on an intermediate stage.**
- **Final representation of VDMA data model is in the scope of the VDMA working group “Engineering Schnittstellen”.**
- **It is not finalized yet and may change during the ongoing work.**