
IDA – View-based visualization of production monitoring and control systems based on AutomationML

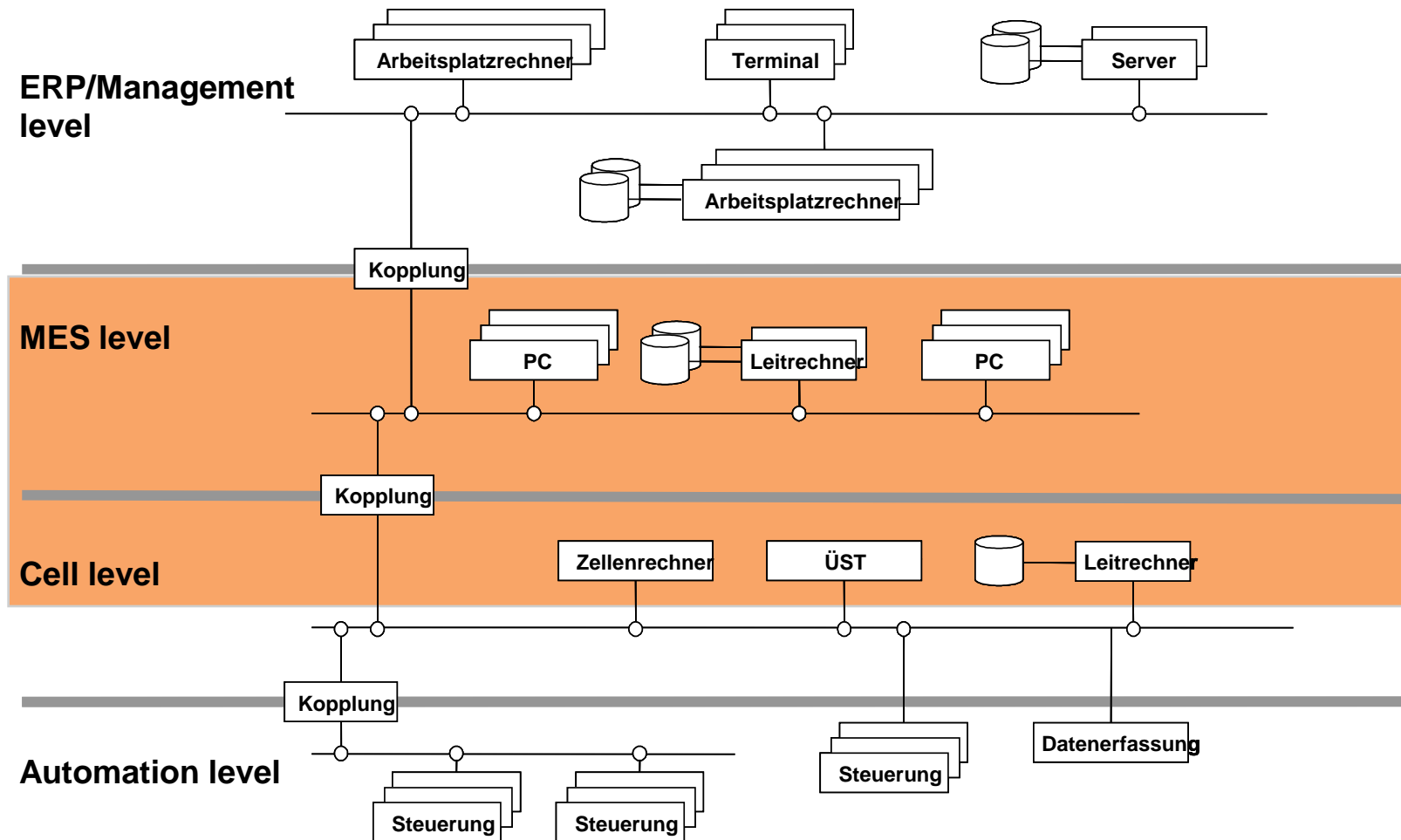
Miriam Schleipen



Agenda

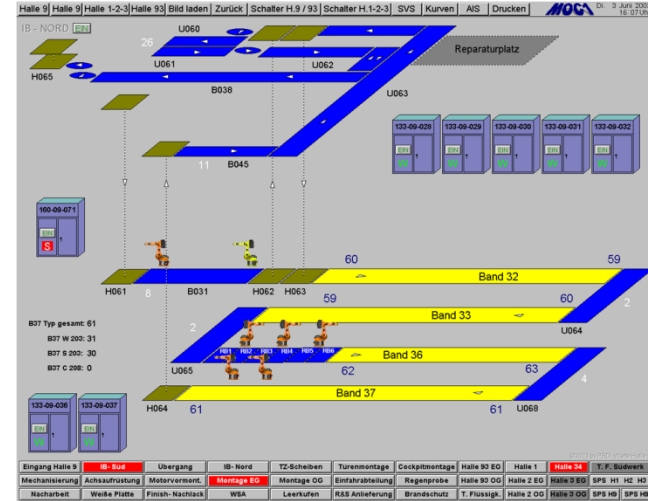
1. Terms and motivation
2. Important and used parts of AutomationML
3. IDA framework process chain
 1. Import and fusion
 2. Projection and processing
 3. View generation and export
4. Summary

1. Definition ‚production-related IT-Systems‘ [Betriebshütte, VDI 5600-1]



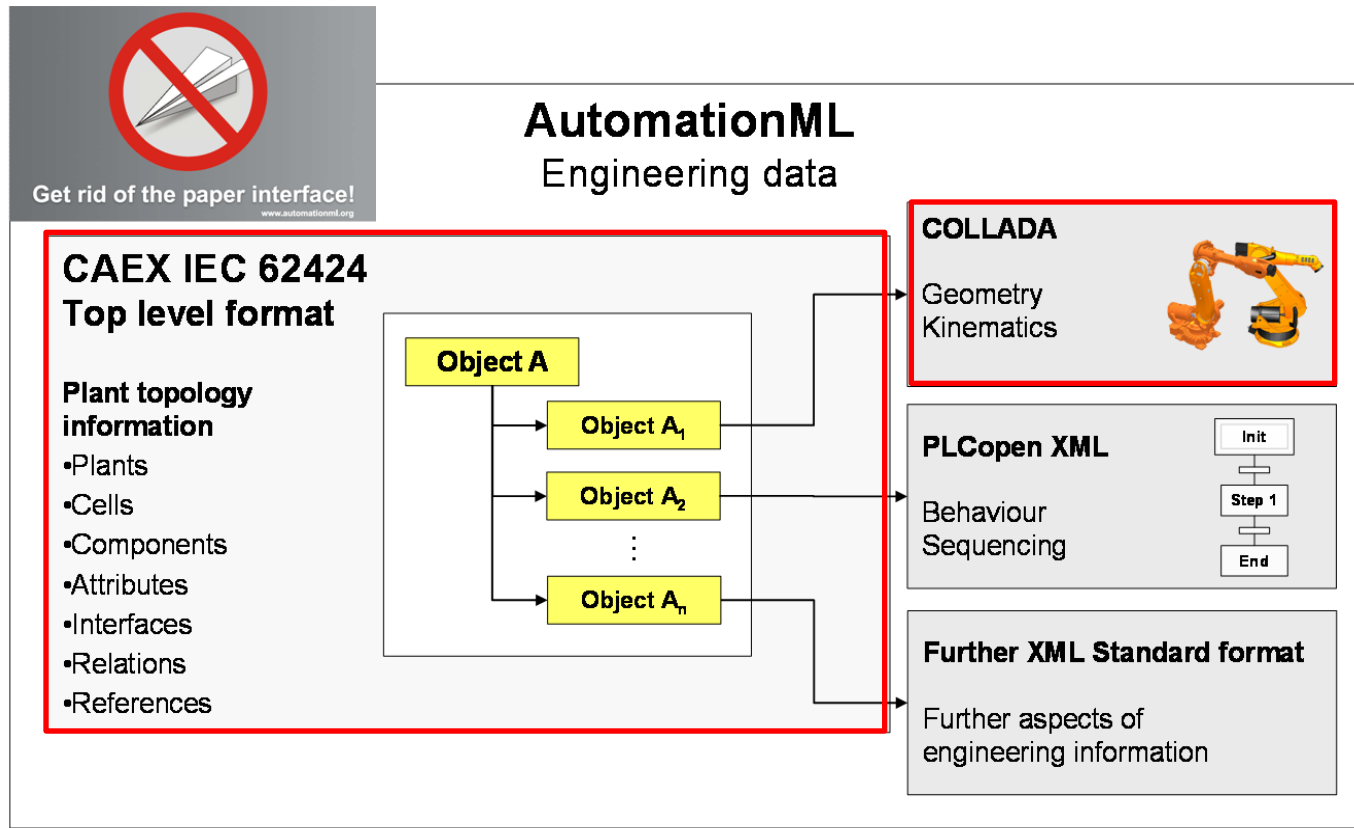
1. Motivation

- Before using a production monitoring & control system: Engineering
- Process visualization = interactive and visible part of production monitoring & control system (view/control)
- Visualization includes: topology and topography information, connection to signals of production process, dynamic visualization of process status
- Engineer gets information as hall layout, signal list, etc.
→ time-intensive, cost-intensive, error-prone
- Goals
 - (Semi-)automated generation of view-based visualization out of already existing information
 - More efficient engineering process



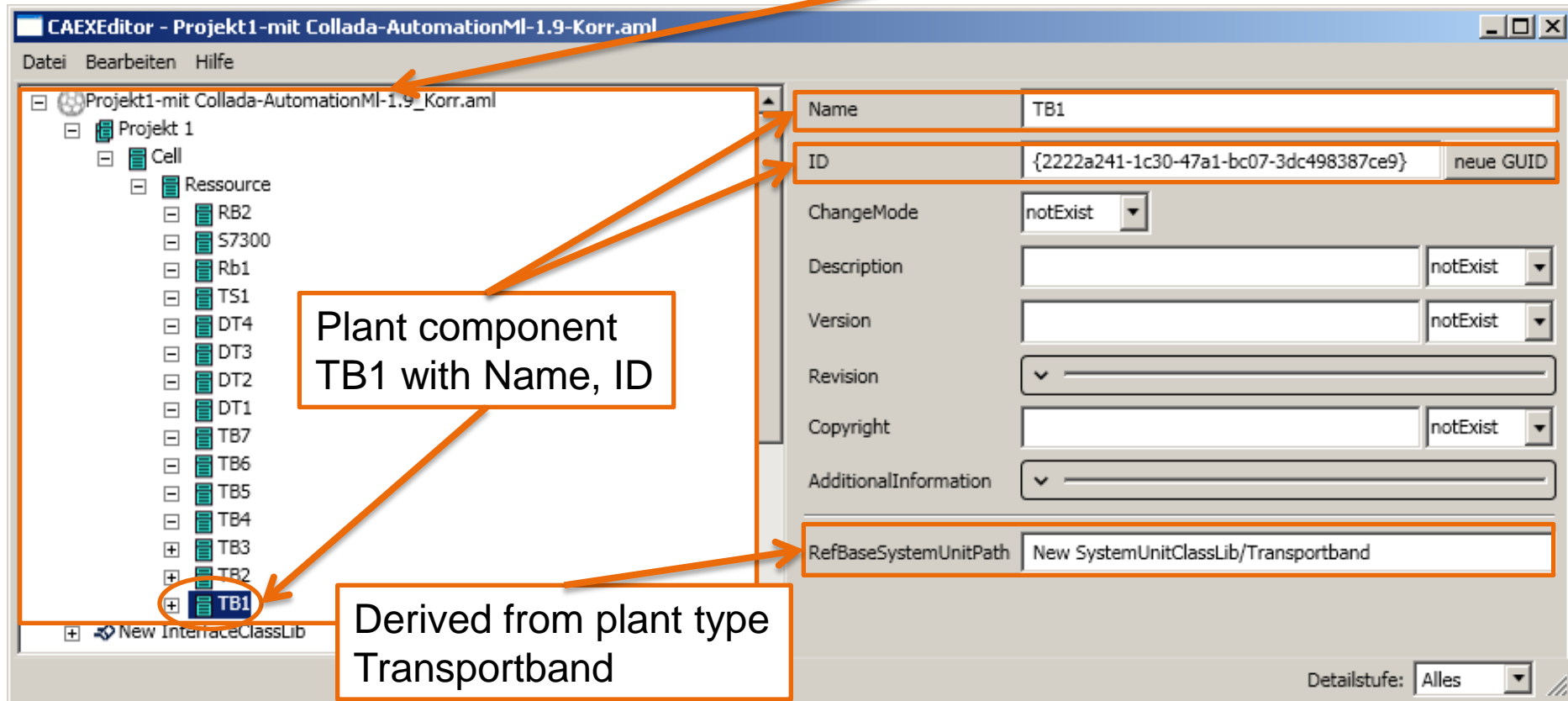
2. AutomationML

- Only parts of AutomationML are of interest
 - Top-level data format CAEX
 - Geometry data format COLLADA



2. Example: AutomationML model – plant components

- AutomationML includes different library types (plant component types, interfaces and roles) and a concrete plant hierarchy with its components



2. Example: AutomationML model – information about single component

- Detail information for TB1 (CAEX and COLLADA)

The screenshot shows the CAEXEditor interface for a project named 'Projekt1-mit Collada-AutomationML-1.9-Korr.aml'. The left pane displays a tree view of the component 'TB1' with the following structure:

- [Attribute] Frame
 - [Attribute] x
 - [Attribute] y
 - [Attribute] z
 - [Attribute] rx
 - [Attribute] ry
 - [Attribute] rz
- [ExternalInterface] Signal2
- [ExternalInterface] Signal1
- [ExternalInterface] Transportband1-PPRConnector
- [ExternalInterface] ColladaRepresentationInterface
 - [Attribute] refType
 - [Attribute] refURI
- [SupportedRoleClass] AutomationMLMIRoleClassLib/ManufacturingEquipment/Transport

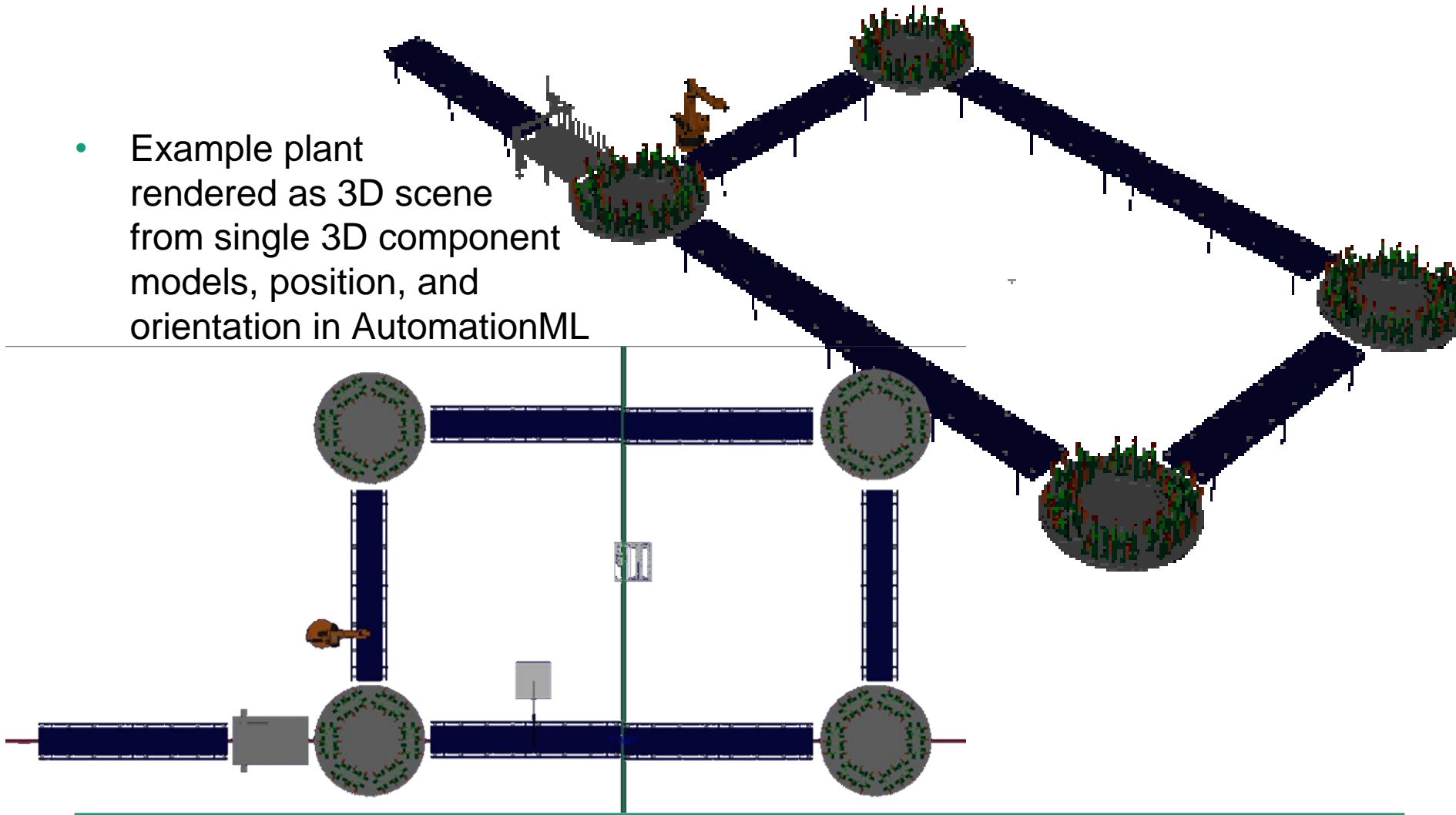
The right pane displays the details for the selected component, including fields for refURI, Description, Revision, Copyright, DefaultValue, Value, DataType, and Unit. The 'Value' field contains the text 'Staurollenf_Mittelst_L6m_B800_aufgst.dae#extraTag'.

Annotations with arrows point to the following elements:

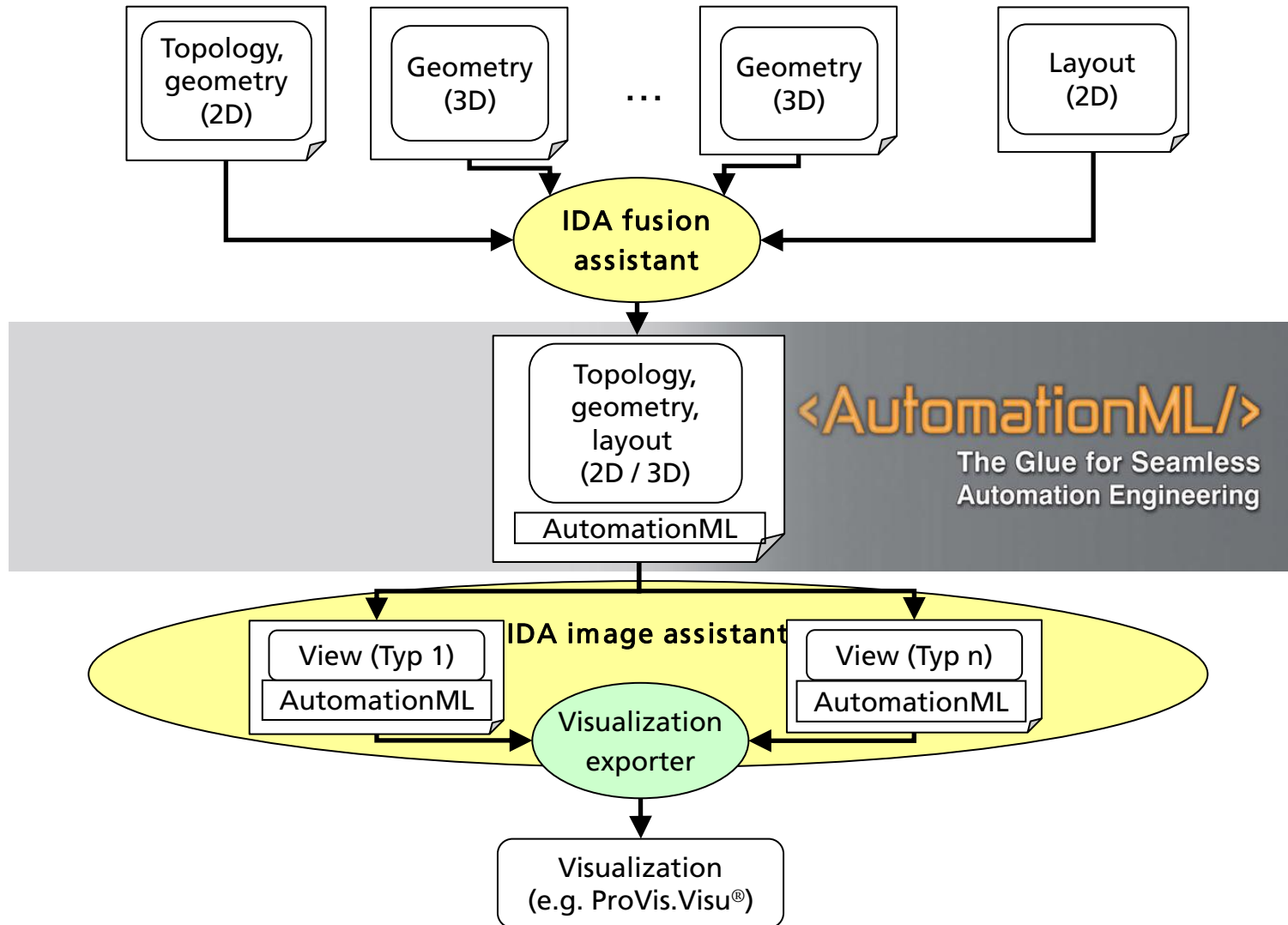
- Frame: Position and orientation in 3D space** points to the 'Frame' attribute in the tree view.
- Different interfaces** points to the 'Signal2', 'Signal1', and 'Transportband1-PPRConnector' interfaces in the tree view.
- Semantic/meaning of component: Transport** points to the 'AutomationMLMIRoleClassLib/ManufacturingEquipment/Transport' role class in the tree view.
- 3D-representation (Collada)** points to the 'ColladaRepresentationInterface' in the tree view and the 'Value' field in the form.

2. Example: AutomationML model – Fused and rendered AutomationML 3D scene

- Example plant rendered as 3D scene from single 3D component models, position, and orientation in AutomationML

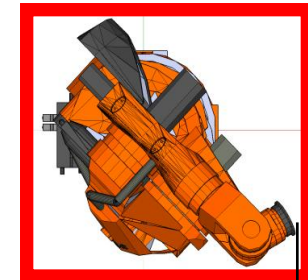
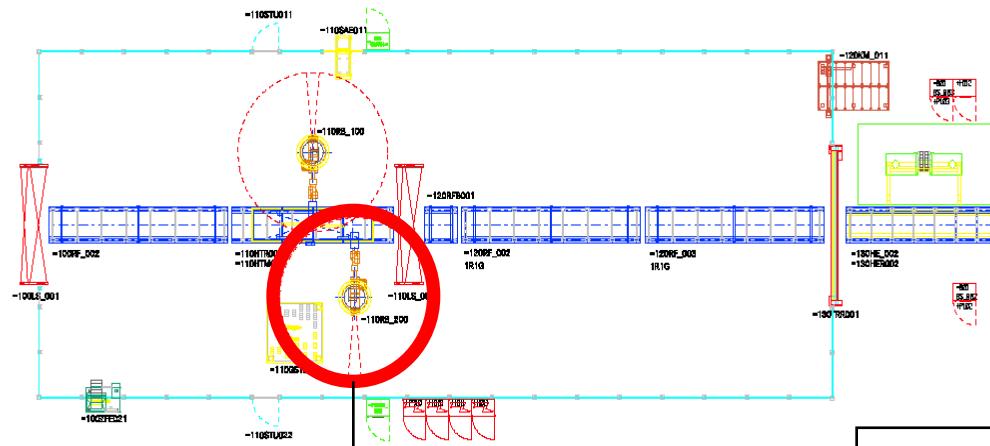


3. IDA framework



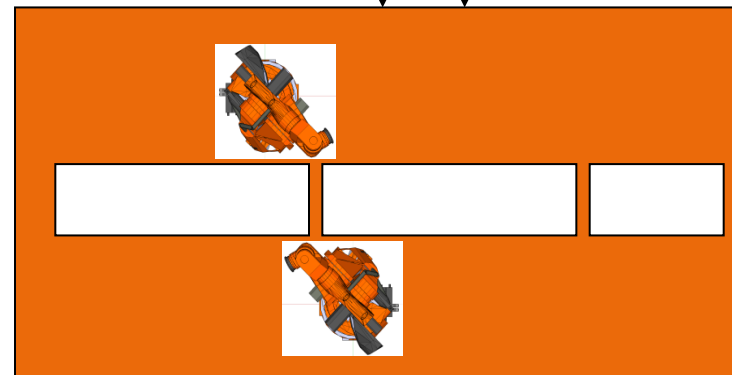
3.1 Import (DXF) and fusion step to AutomationML

- Information from different tools/formats necessary
→ Fusion in AutomationML model



Detailed 3D information

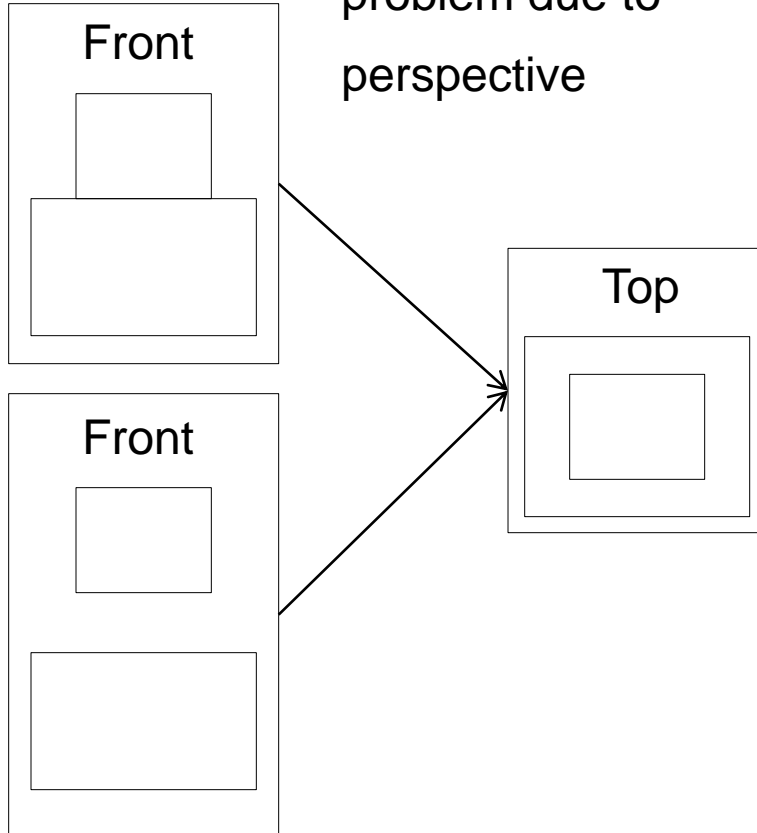
Positioning,
dimensioning,
type, name



Process visualization

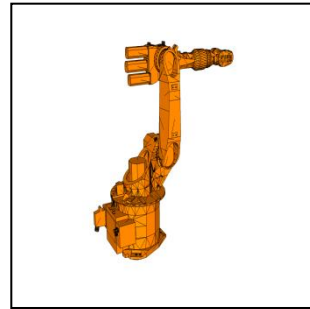
3.2 Preparation/Processing - Problems

Silhouette
problem due to
perspective

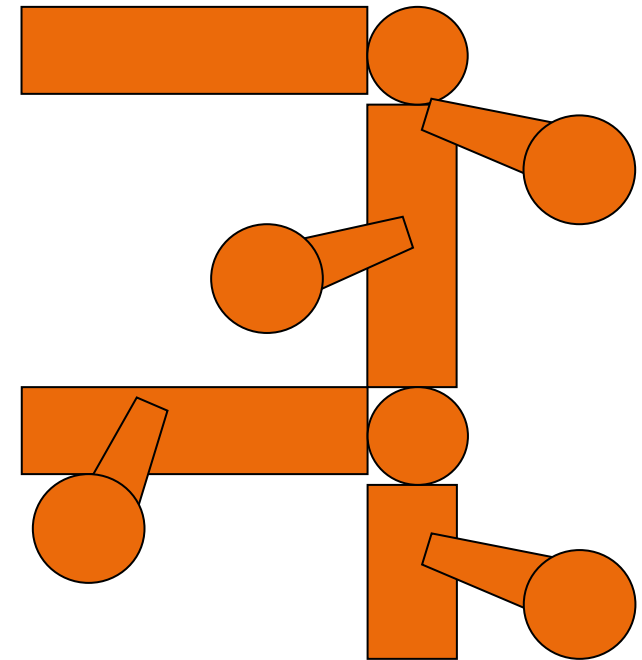


Detail problem due to complexity

Detailed,
single
component



Rough, half/line

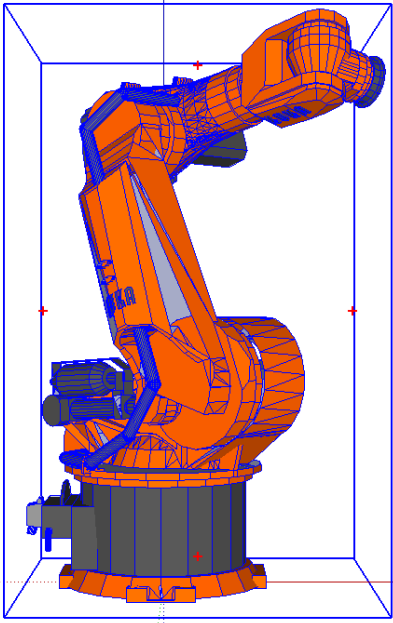


➔ Different complexity levels in IDA framework possible

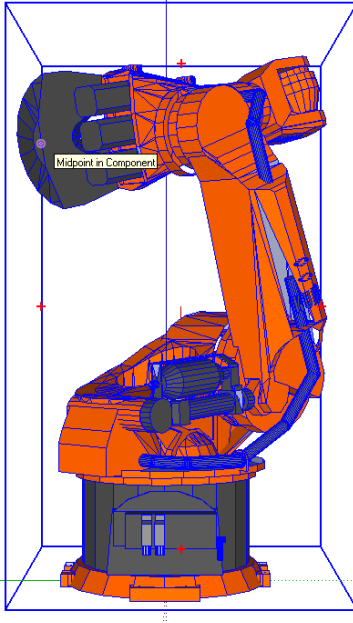
3.2 Processing – Projection

- Level 1: Bitmaps from different point of views
- Benefit: Simple, easy to create and to integrate

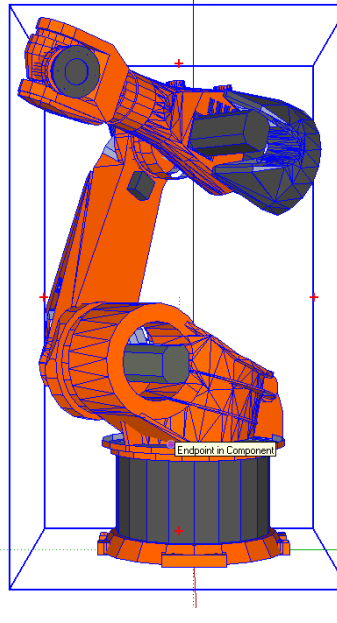
Front



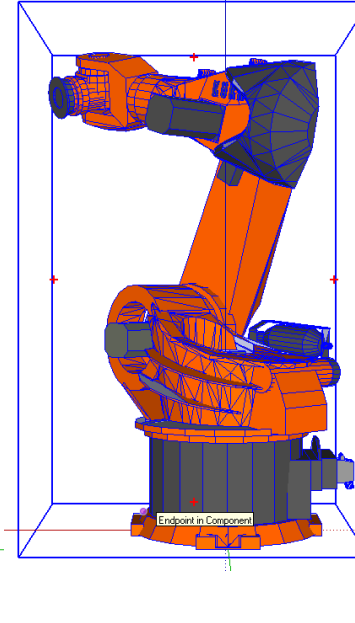
Left



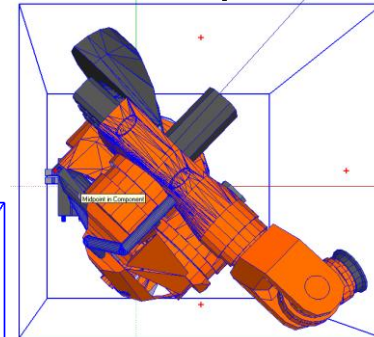
Right



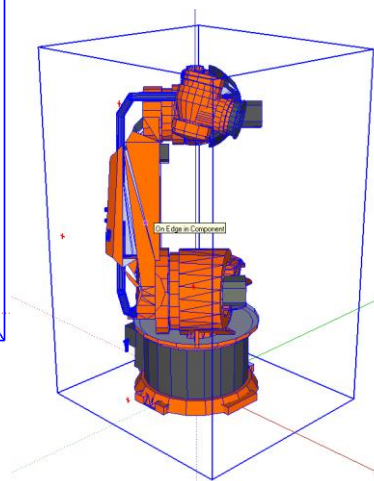
Back



Top

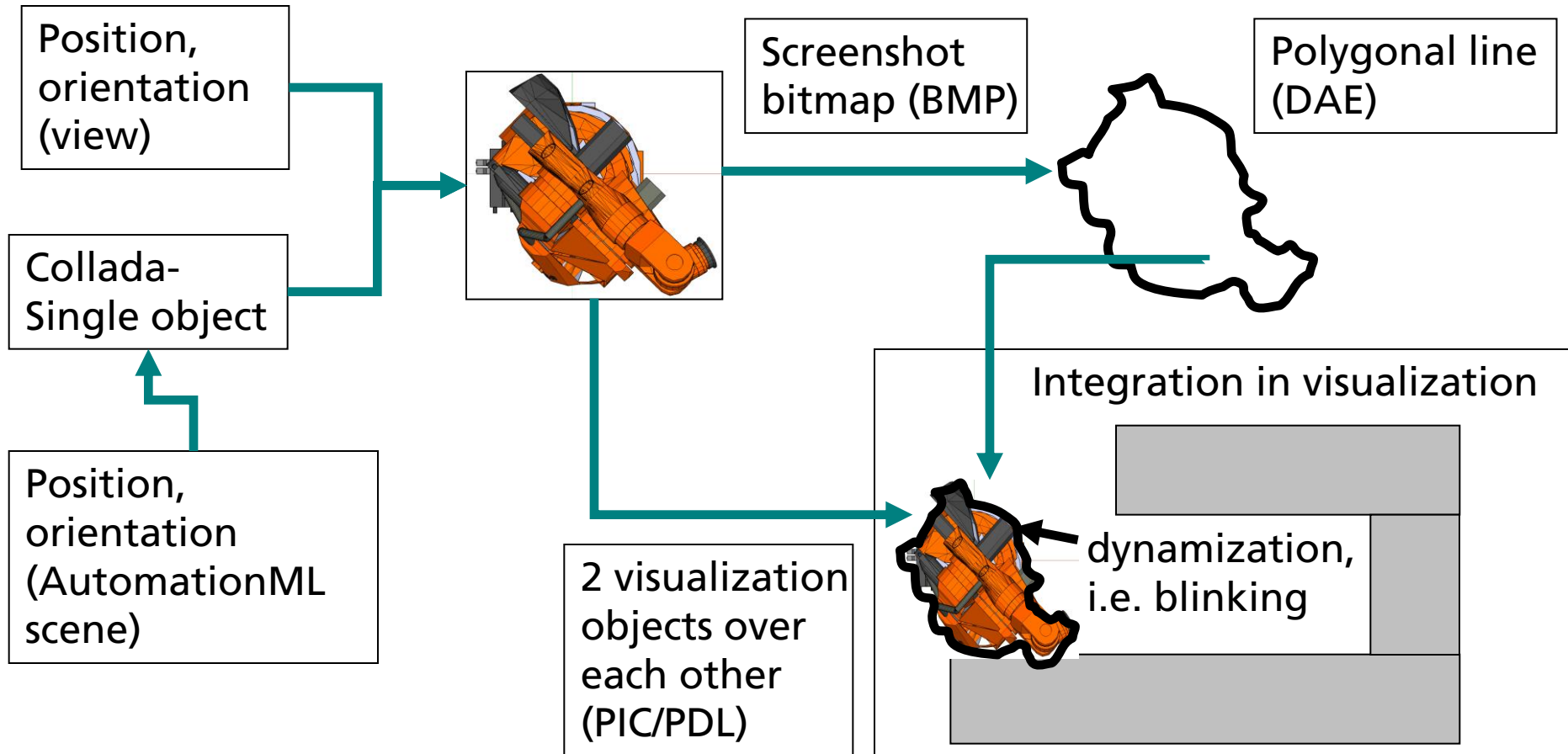


ISO



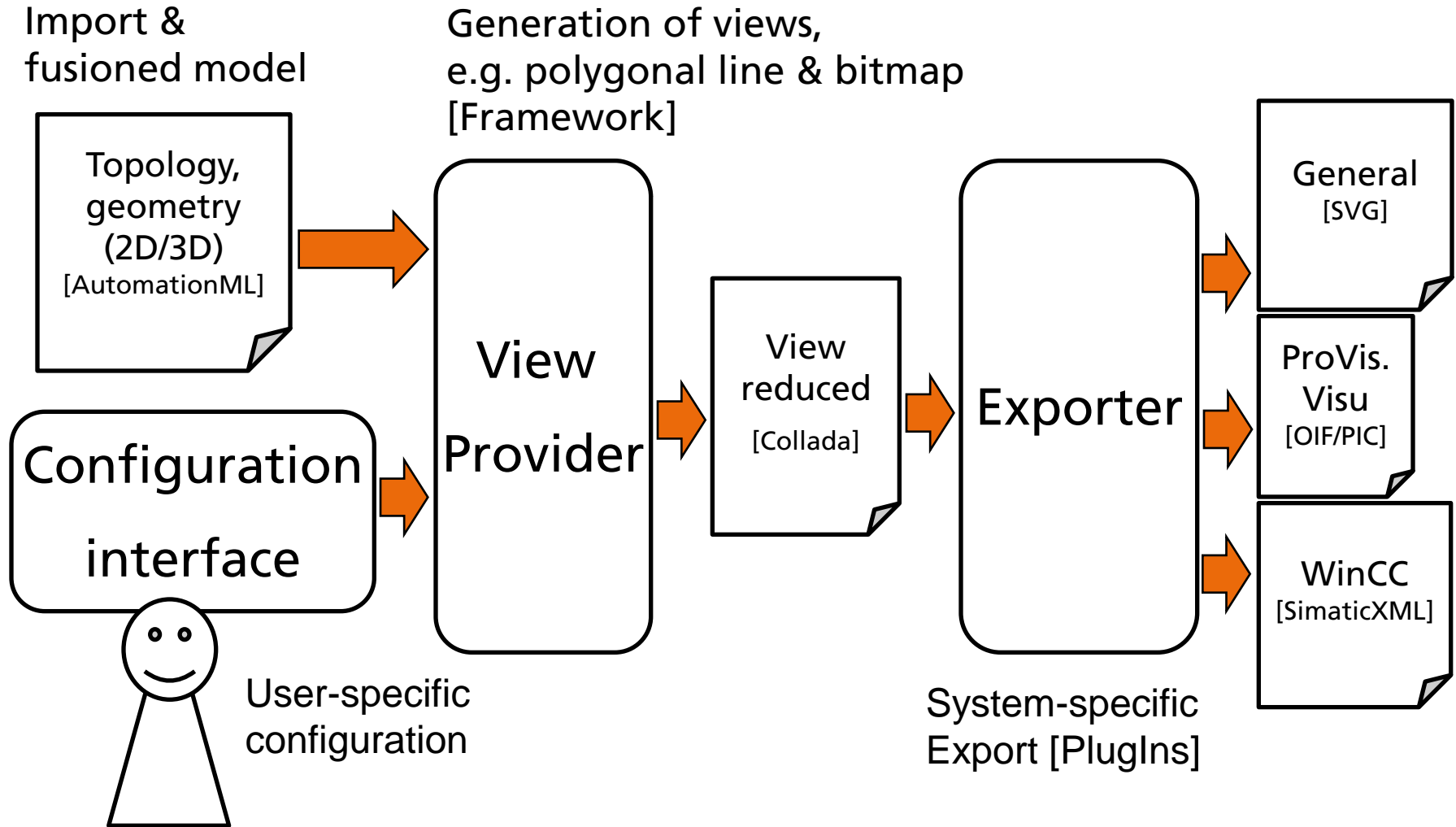
3.2 Processing – Combined image information

- Level 2: Combination of bitmap and silhouette as polygonal line
- Benefit: Dynamization of polygonal lines for colour change, etc.

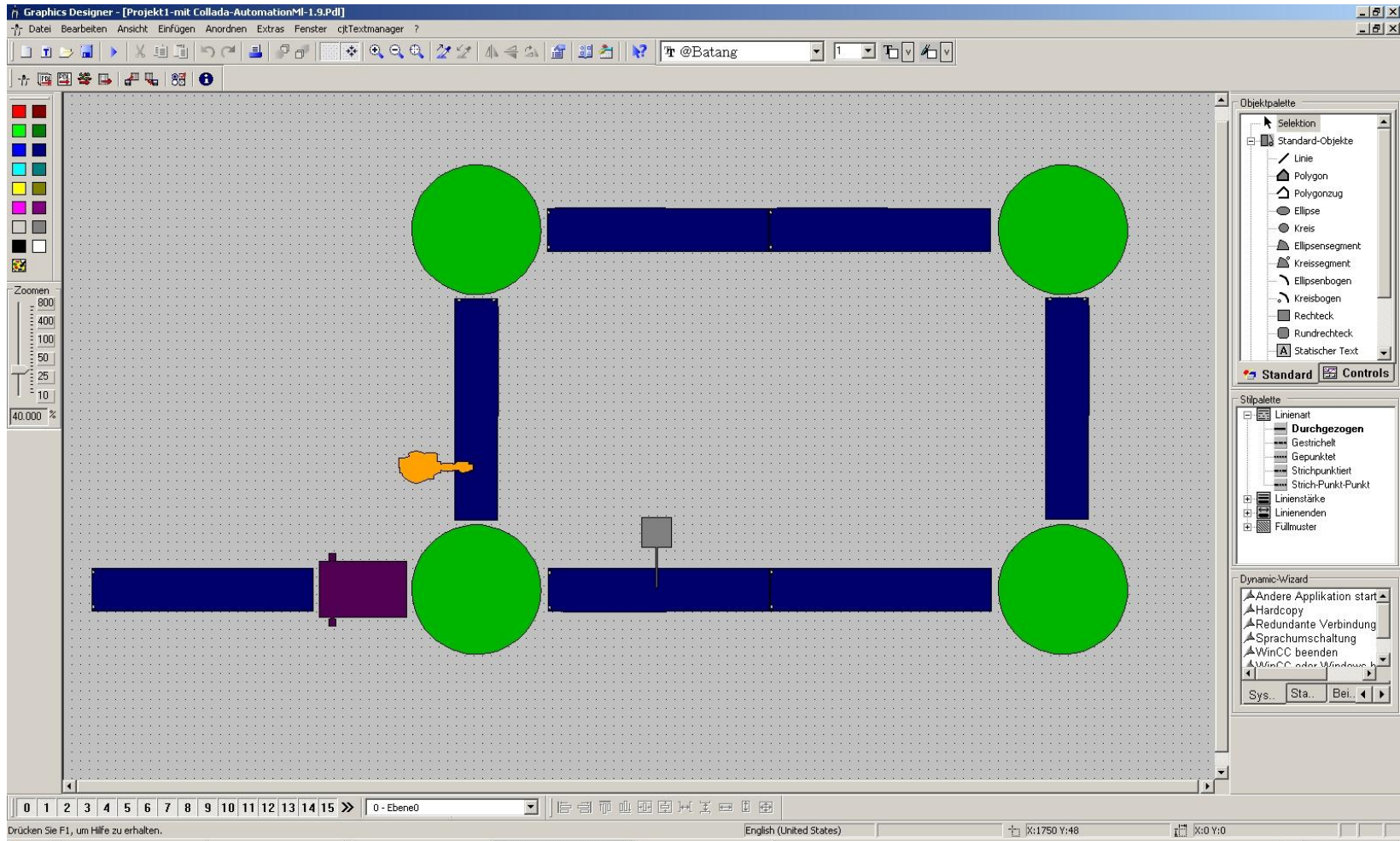


- Level 3: Parallel projection, calculation of visible contour

3.3 View generation and export to target systems (generic plugin concept)



3.3 Export of overall scene/cells/layouts to target systems (example: WinCC)



Summary

- Generic IDA concepts:
Framework, adapter, plugins
→ all-purpose, extendable,
re-usable
- Import from different sources
(Possible import data:
DXF, COLLADA, AutomationML,
CAEX)
 - Fusion in AutomationML model
 - Preparation of data and projection to 2D
 - Generation of views
 - Export in target systems (implemented target systems: ProVis.Visu,
WinCC, neutral (SVG))



Import

Fusion

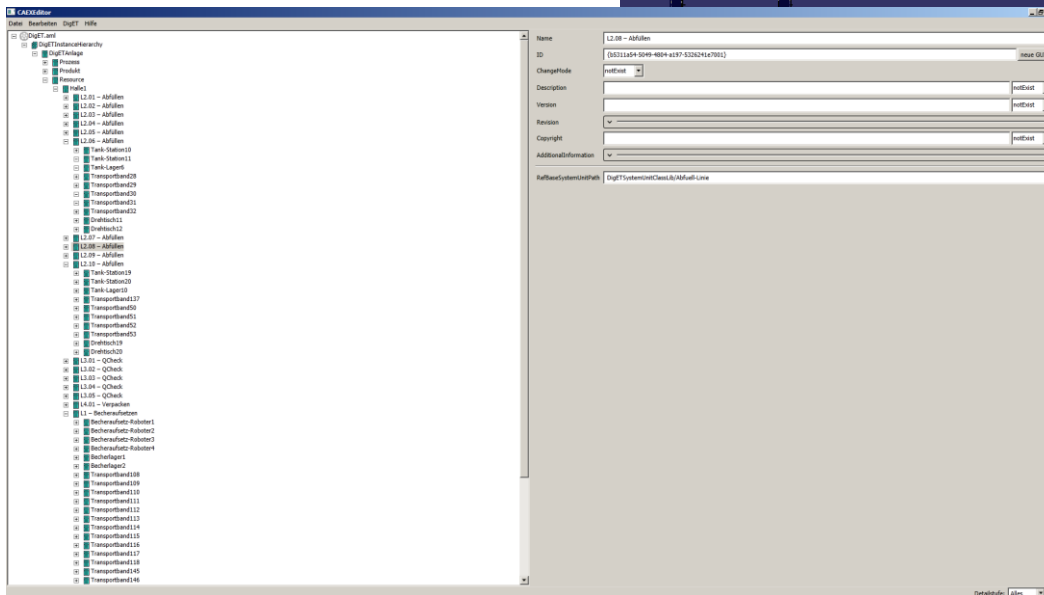
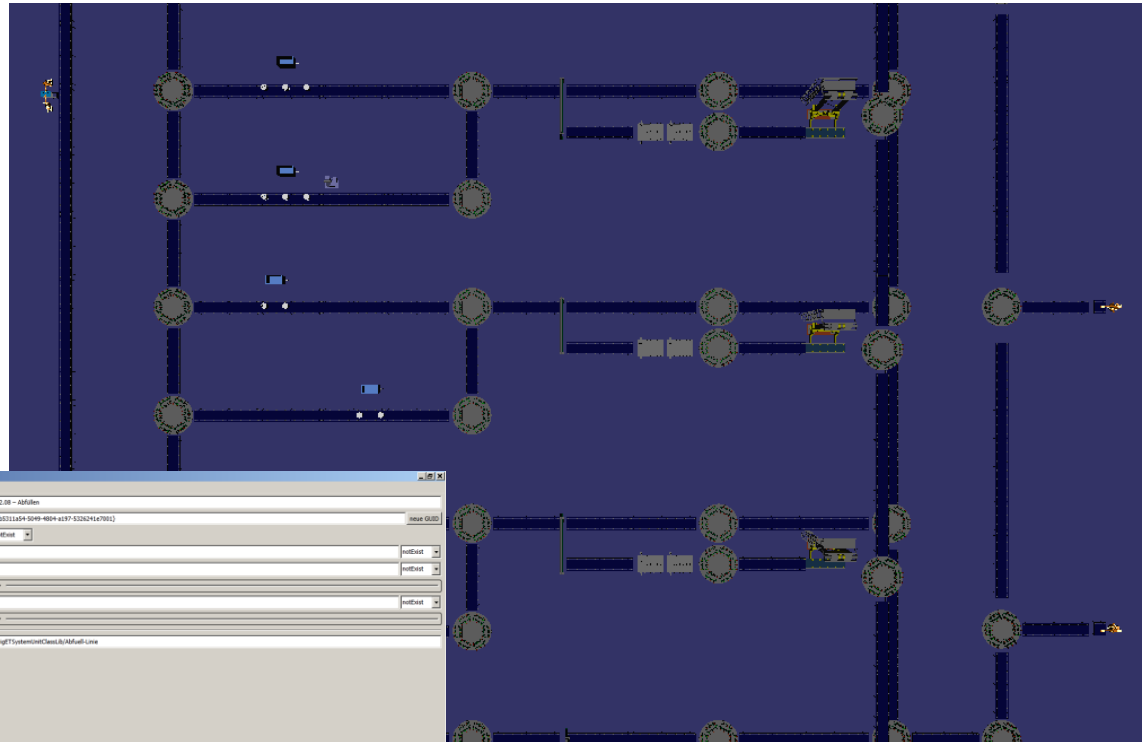
Projection/
Processing

View
generation

Export

Please visit demos at AutomationML Conference

- CAEX-Editor
- IDA-Framework
- AutomationML-Test



Thank you!



Impressum

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AutomationML

Böblingen, Mai 2012

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