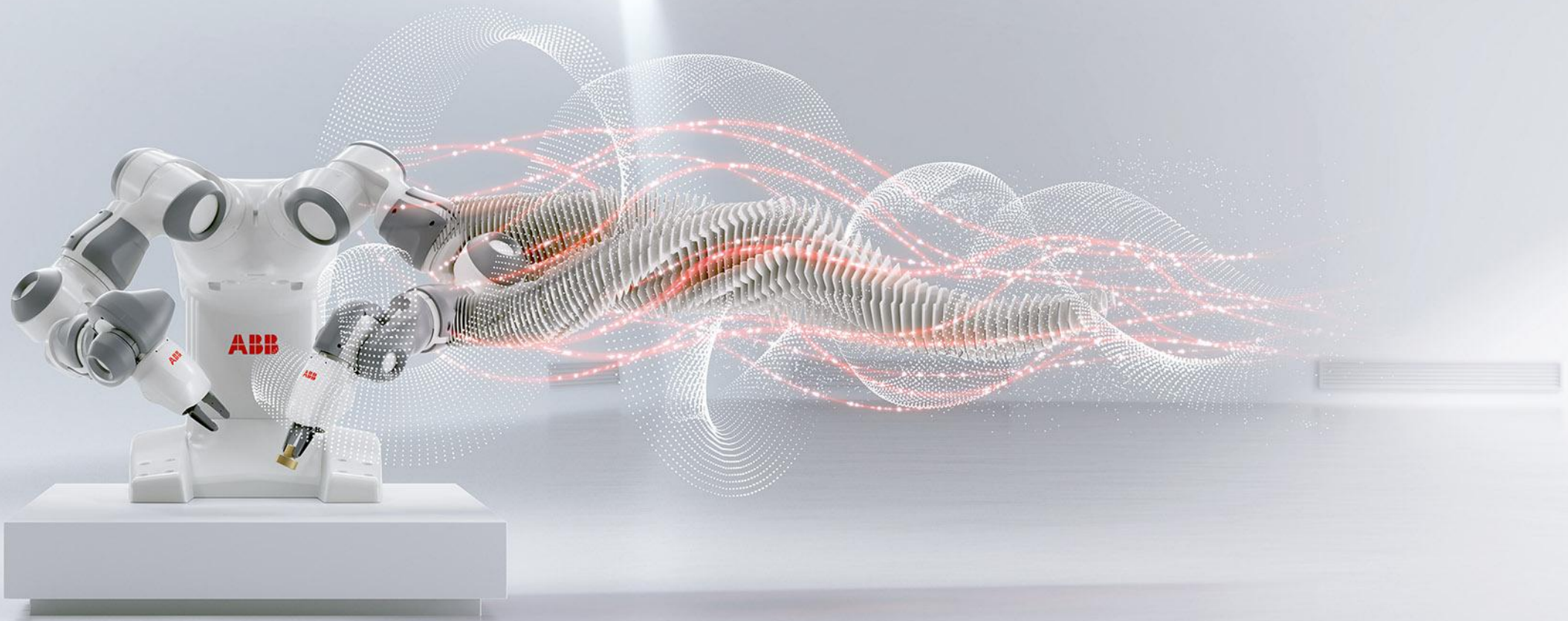


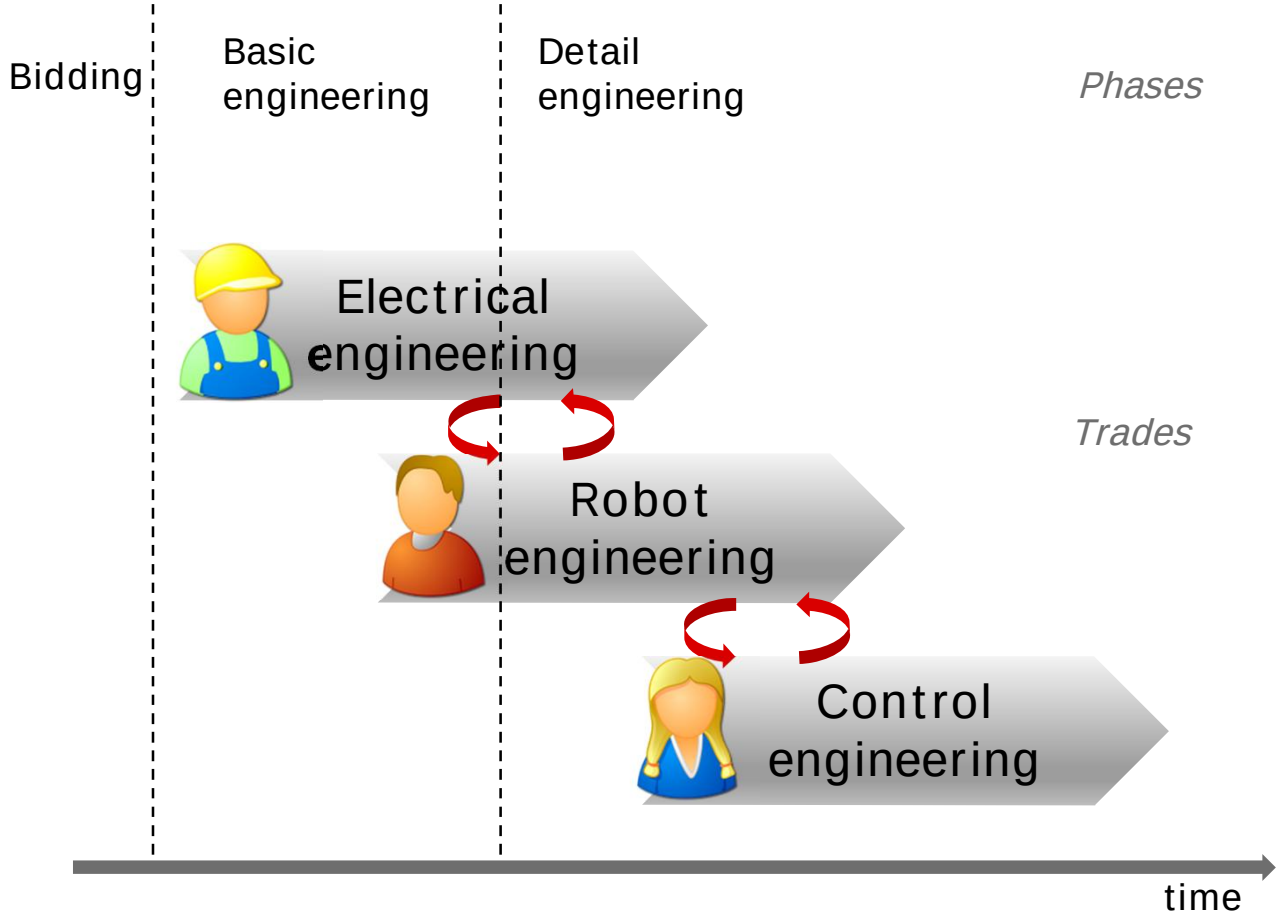
2018-10-25 AUTOMATIONML CONFERENCE - KATHARINA STARK, PABLO RODRIGUEZ, JÖRG HENß, STEPHAN SEIFERMANN, THOMAS FUNKE, DIETER GOLTZ, LORENZ HUNDT

Cloud-based integration of robot engineering signals using AutomationML

First experiences using logi.cals' AML.hub in combination with ABB's RobotStudio

Extract of a Project Workflow

Typical automation engineering project



- An automation engineering project consists of different phases
  - e.g. ‘Bidding’, ‘Basic engineering’
- Each phase may involve different trades
  - e.g. ‘Mechanical engineering’, ‘Control engineering’
- Typically, each trade uses another (engineering) tool
  - e.g. ‘EPLAN’, ‘RobotStudio’, ‘logi.CAD’
- The tools need to exchange data with each other
  - e.g. geometry data, signal information

Public funded project INTEGRATE*

Project Vision

Project Goal:

- Develop an extensible service platform specifically for industrial engineering data based on AML.Hub -> ‘INTEGRATE platform’

ABB Vision:

- Eliminate the friction of data exchange and integration
- Create and access a consistent engineering data repository where stakeholders are able to get data views and are able to create services

Challenges:

- Interoperability problems between engineering tools
- Unmanaged model inconsistencies
- Missing exploitation of industry standards

Benefits:

- Collaboration over vendor borders
- Fast implementation of changing customer requirements
- Propagation of changes throughout a whole tool chain

* The authors were partially supported by the INTEGRATE project funded by BMWi (support code 01MA17001D) as part of the program PAiCE

Data format

AML and the AR APC

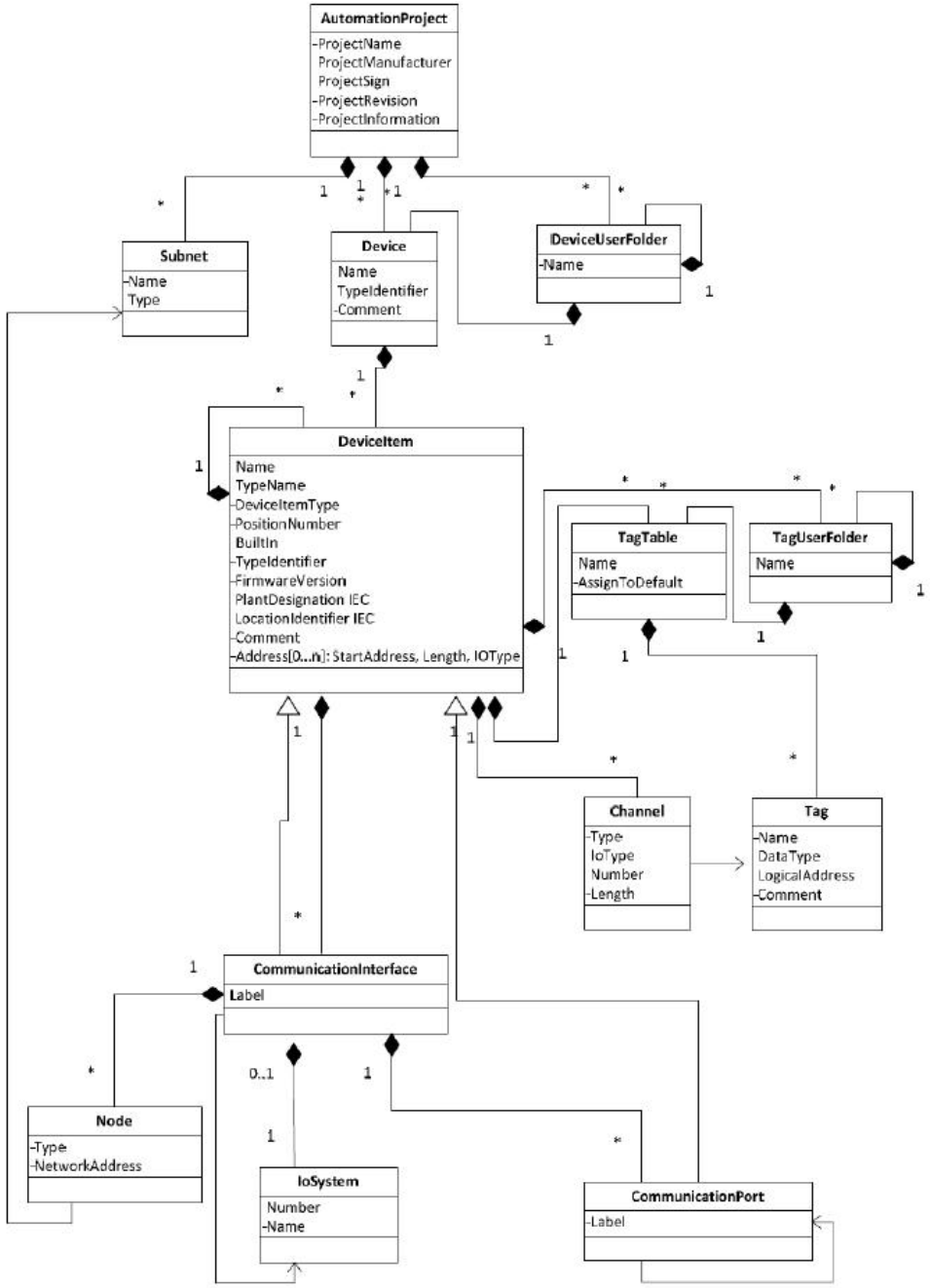
Why use AutomationML (standardized in IEC 62714) ?

- Separate definition of syntax and semantics
- Greater flexibility during data exchange
- Engineering tools are still able to evolve and to change their data format.
- Role libraries provide a minimum set of information so that others can understand the data

What is the AR APC?

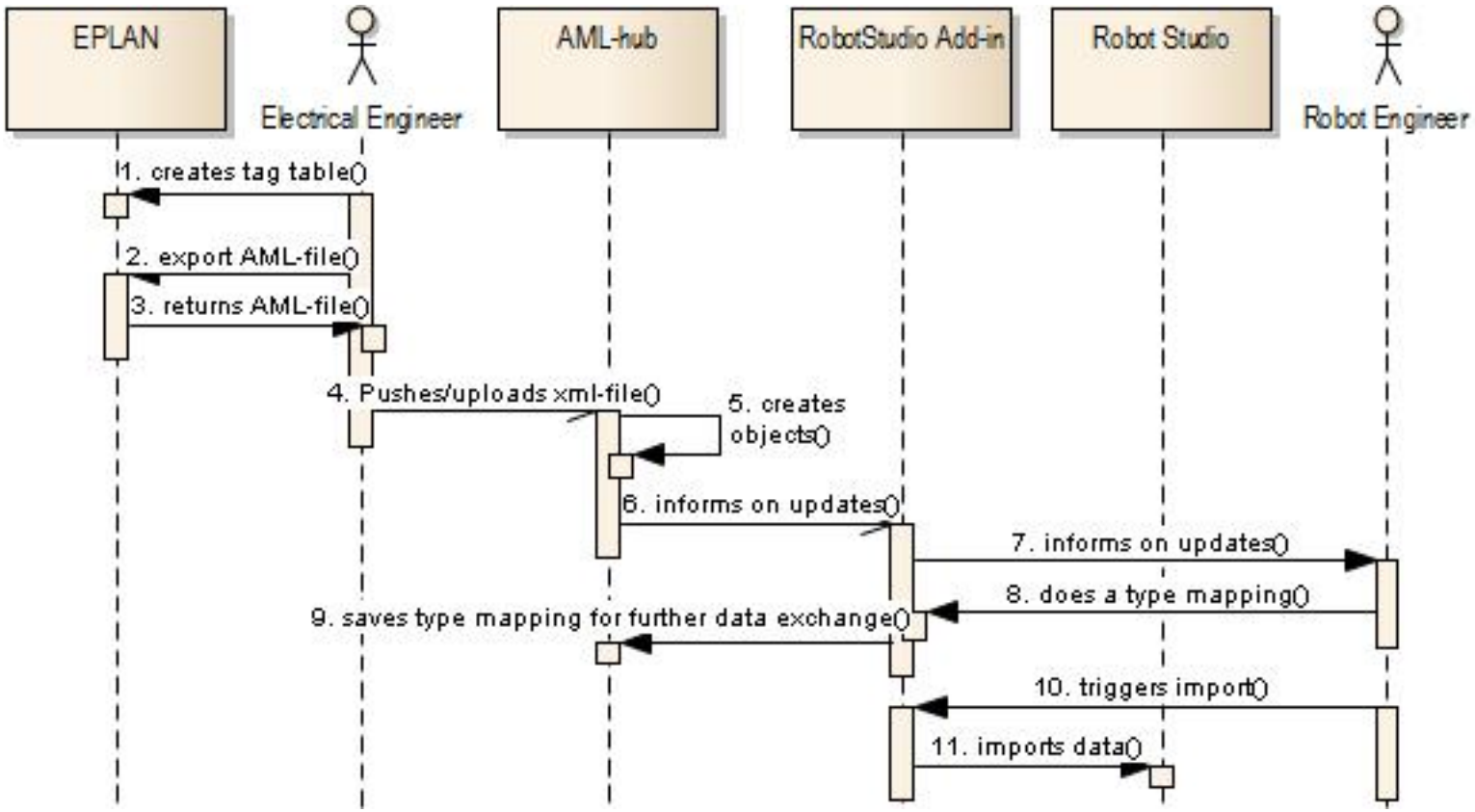
AR = Application Recommendations, APC = Automation Project Configuration

- Describes how to model the PLC-configuration using AML (see right figure)
- Describes the engineering workflow:
  1. Make PLC-configuration in the PLC-engineering tool
  2. Import to ECAD and create tag tables
  3. Import back to PLC-engineering tool



For AR APC see here: https://www.automationml.org/o.red.c/publications.html

A typical use case



Precondition:

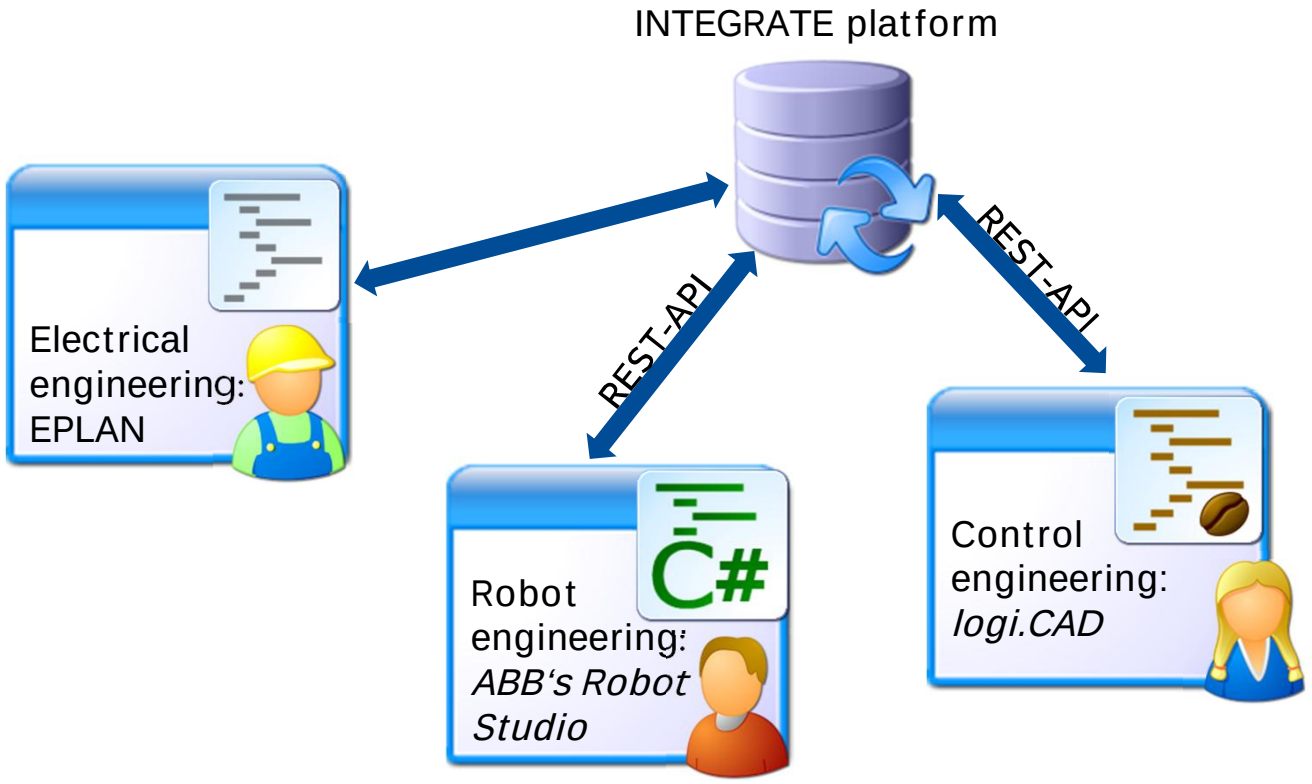
PLC-configuration is already imported from AutomationStudio into EPLAN

Steps:

- Electrical engineer creates signals, allocates them to the IO-cards and exports AML-file
- AML-file is pushed onto the INTEGRATE platform in the cloud via web interface
- Robot engineer can download the signals into RobotStudio via a plug-in accessing the INTEGRATE platform
- Type mapping can be skipped as the standard AR APC is used

Tools and Architecture

Accessing the INTEGRATE platform



Why REST?

- Usage of different programming languages possible
- Access of other computers / servers possible -> INTEGRATE platform can be deployed in the cloud

Some commands used to access the INTEGRATE platform:

- POST /projects/:proj
- GET /projects
- GET /projects/:proj

Live demo

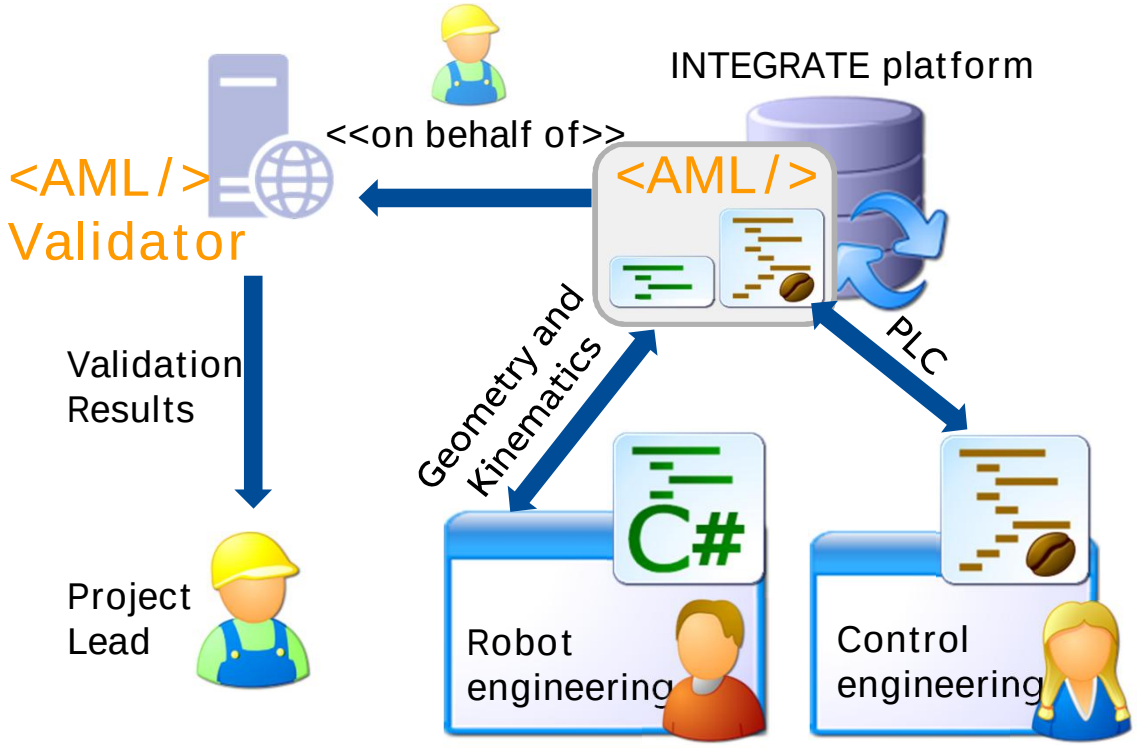
Security

Project Goal:

- Develop an extensible service platform specifically for industrial engineering data based on INTEGRATE platform

Security Requirements:

- Controlled information flow: Partial views of project data for subcontractors and engineering roles
- Extensibility: Platform should support the integration of trusted third-party services for model validation, part list calculation, …
- Simple integration with existing solutions for authentication and authorization



Security

Enabling Technologies

Use of

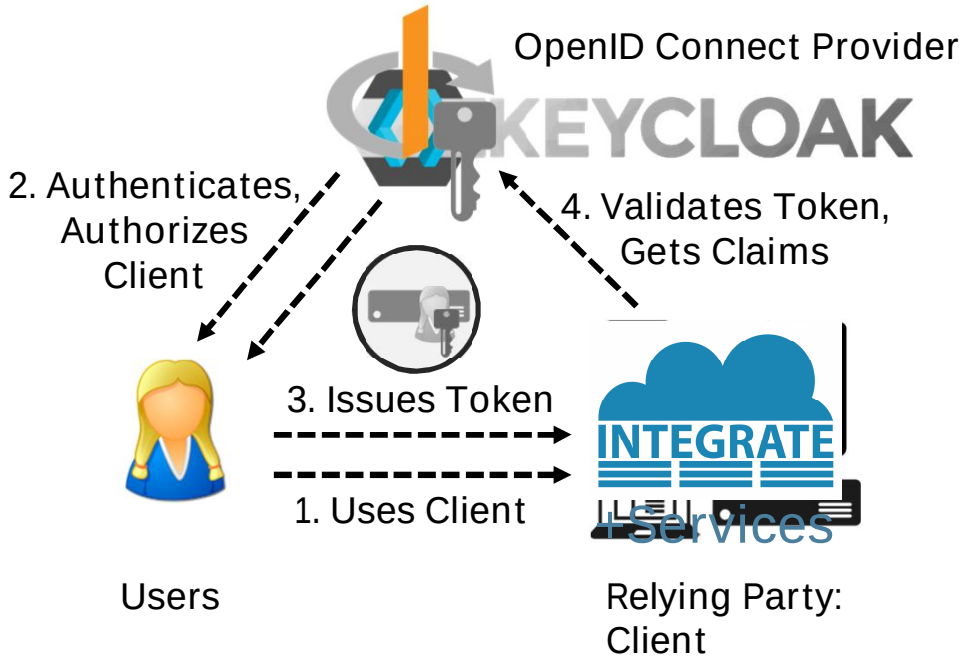
- OpenID Connect for authentication, and the underlying
- OAuth 2.0 for authorization of services and permission sharing

Advantages

- Widespread industrial standard: Users and maintainers include Google, Microsoft, Amazon, …
- Abundance of platform and client implementations

Used Implementation: Keycloak

- Straightforward integration of identity providers using LDAP / AD etc.
- Extensive Web UI and REST interfaces for user management



OpenID Connect / OAuth 2.0: Basic Usage Flow

Security

Authorization Concept

Permissions Schema

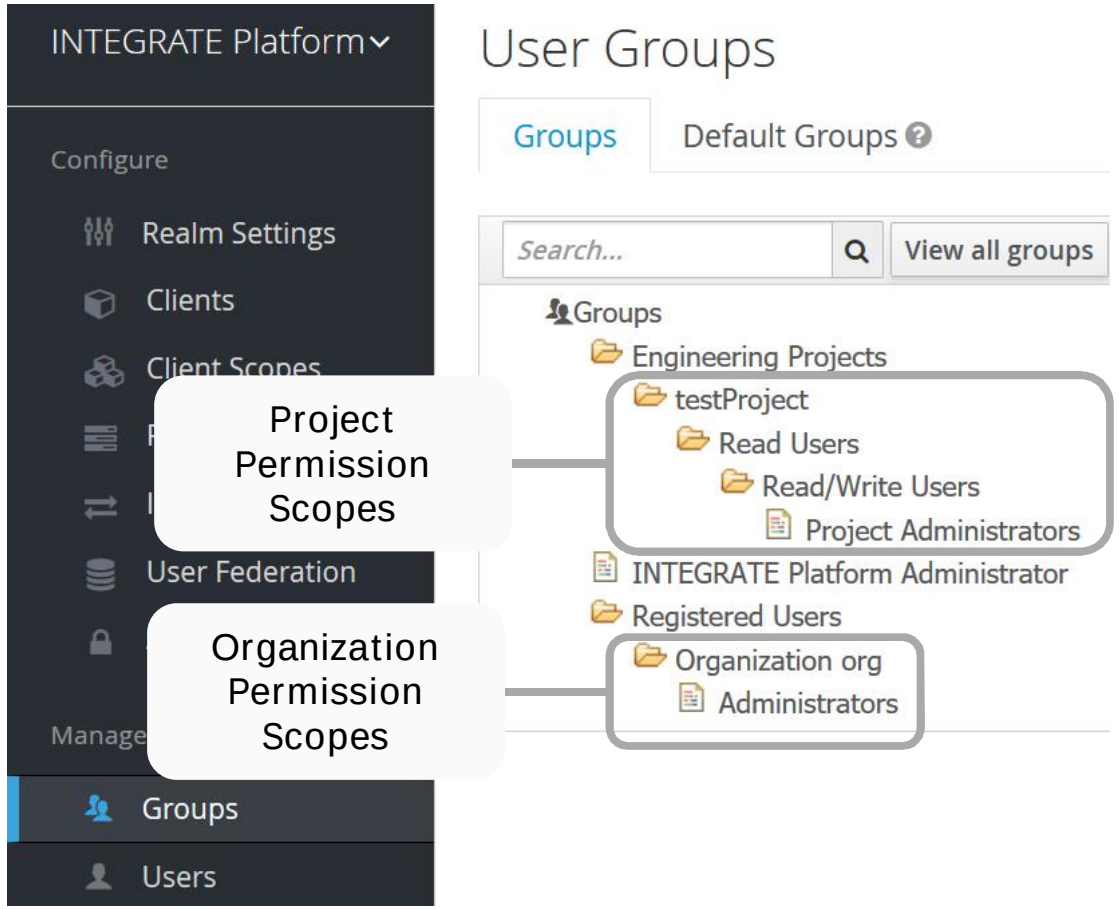
- Authorization per project, organization, and view
- Permissions mapped to hierarchical groups in Keycloak
- Permission groups can be assigned to registered users by other authorized users

Current status

- Implemented for all services

Next step

- Realization for dynamically defined restricted views, i.e., views for specific subcontractors or engineering tasks

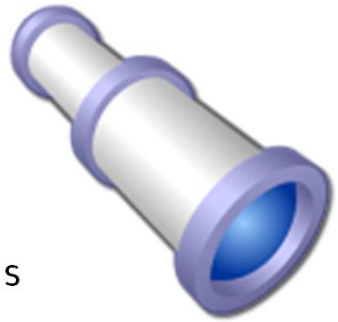


Outlook

Possible next steps

RESTful interface:

- Extend API to allow creation and alternation of single objects in the plant hierarchy
- Security: Authentication and authorization for each operation



Data model and consistency:

- Try out the „Vitruvius“-framework for model mapping developed by FZI
- Develop concepts for different project granularity and/or different subparts in different engineering tools

Engineering tools:

- More engineering tools to import and export AML, possibly directly via REST to the INTEGRATE platform within the research project:
  - DriveSize (ABB)
  - logi.CAD (Logi.cals)


ABB