

Technical Integration of Engineering Environments Across Engineering Disciplines

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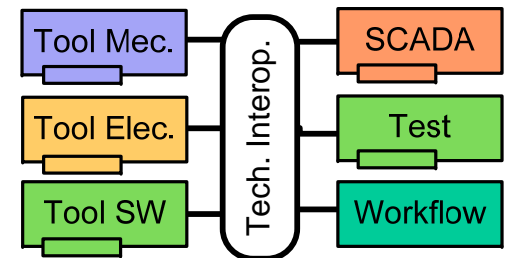


Agenda



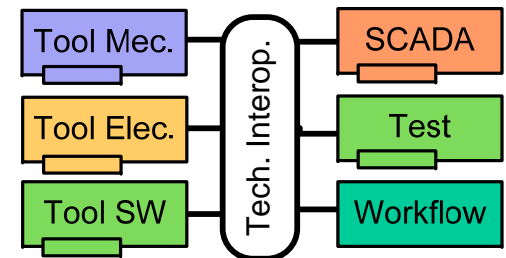
- Motivation
- Integration Challenges
- State of the Art
- Use Cases
- Research Approach (Open EngSB)
- Paradigms
- Technical Integration and Security
- Planned Results

1. Observed **trends in software-intensive systems** development
2. Surprisingly little work on the flexible, efficient, and robust **integration of engineering tools** across engineering disciplines.

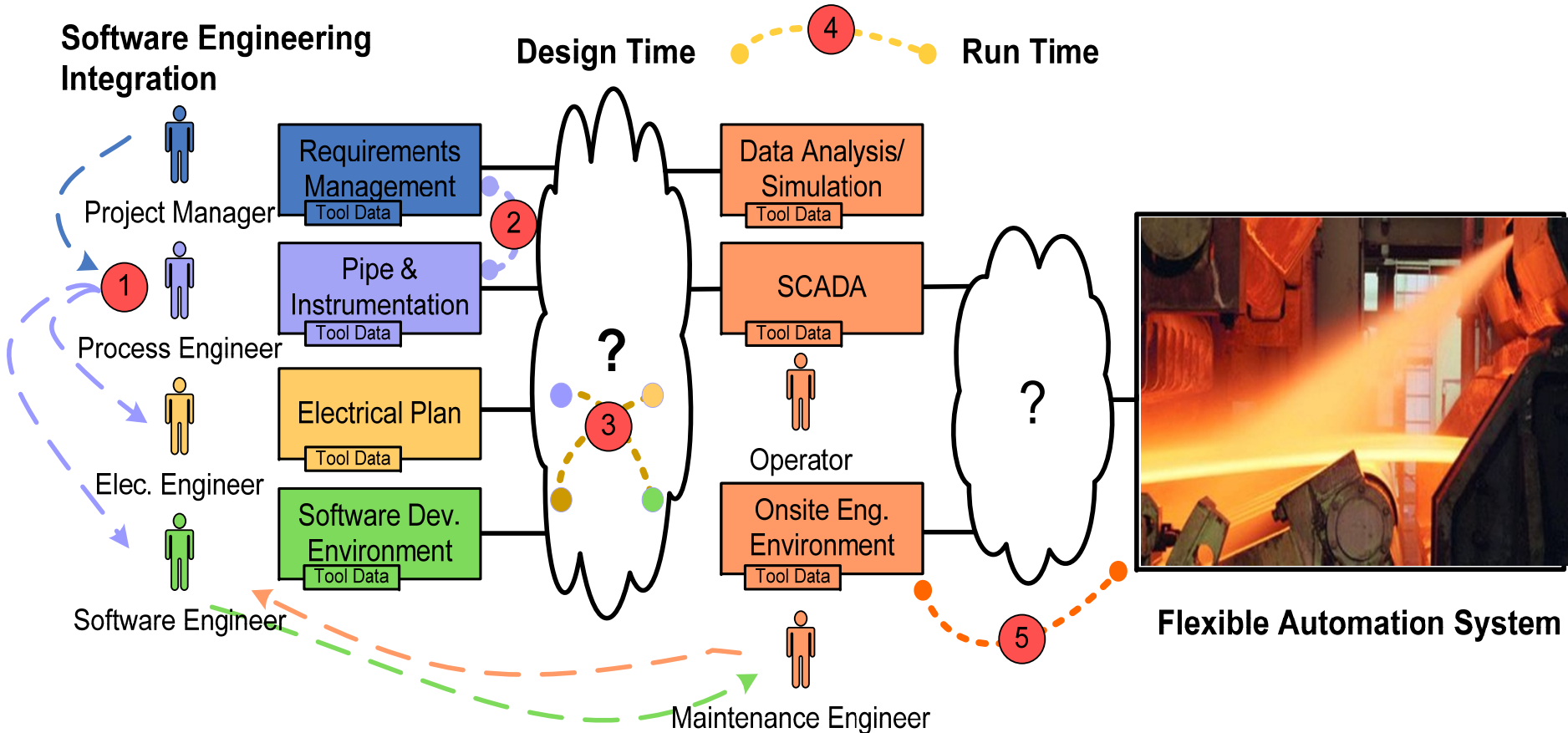


Goal

- Concept & tools for agile (software+) engineering environments.
- Introduction of “**Engineering Service Bus**” (EngSB)
- **Concept evaluation** based on real-world use cases and prototypes
- Focus on **Technical Integration of Tools**



Integration Challenges and Requirements



Requirements for the Integration Solution



- Vendor-neutral: why?, Open Source
- platform-neutral;
- “Science Friendly”

- tailorable
- incremental introduction process.

- **Vendor-specific integration** in automation engineering (e.g., Comos PT)
- IDE-based point-to-point integration concepts (e.g. Eclipse)
- **Enterprise Service Bus (ESB)**: generic model, needs adaptation to automation software engineering environments.
- Service Oriented Architecture

Our Previous Work in this Context



- Tool integration studies in **Air Traffic Management** domain (Frequentis).
- **Event-Driven Architecture (Middleware)**
- **Technical integration** concepts for automation/software engineering environments, derivation of ESB configuration.

Defect detection in the Engineering Process

State of the Art



- Methods for **defect detection** in **general software engineering**:
 - Artifacts inspection
 - model checking
 - Testing
 - test-first development
- UML model versioning and conflict detection

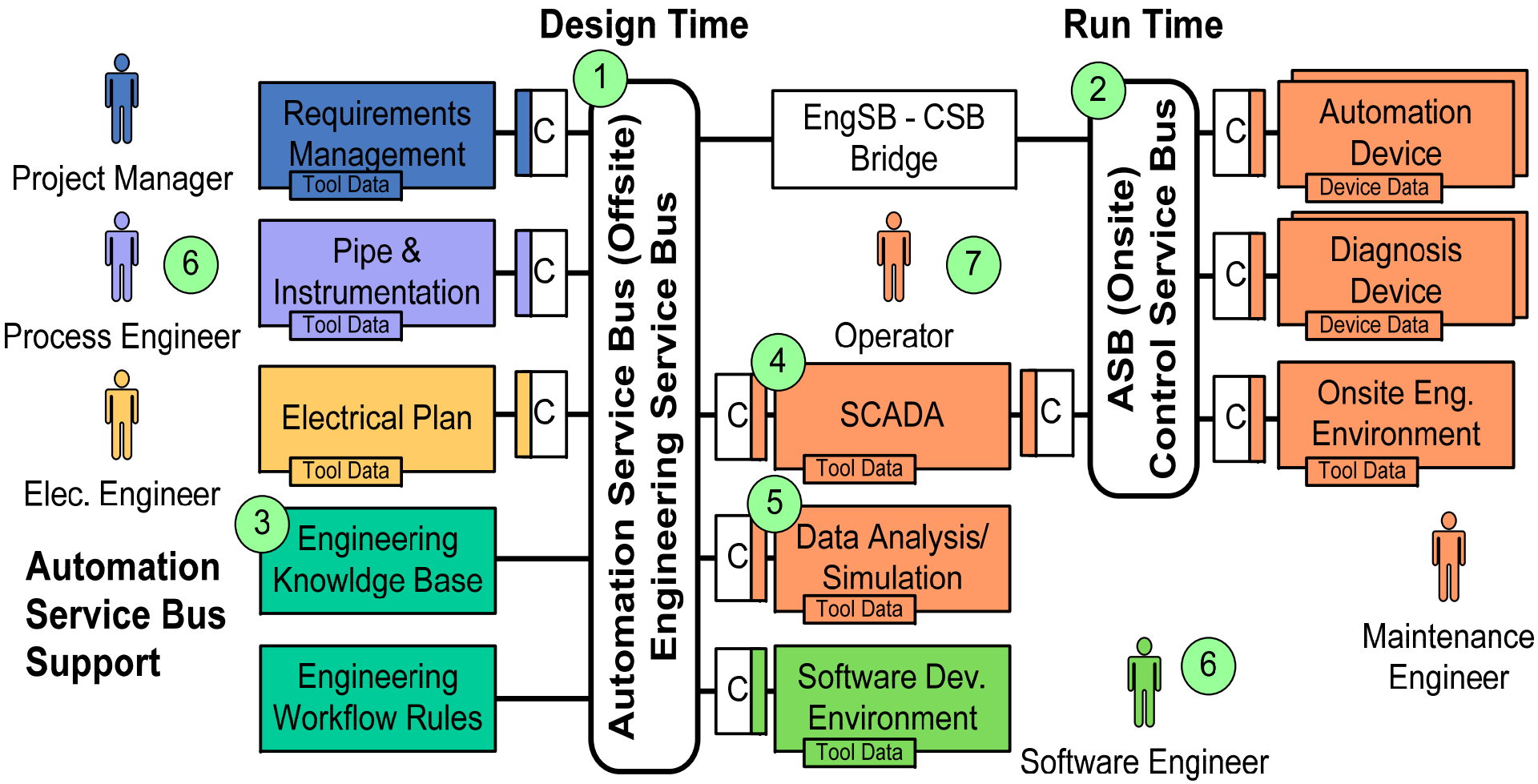
→ Adaption for Automation Engineering necessary

Defect detection in the Engineering Process: Our Previous Work

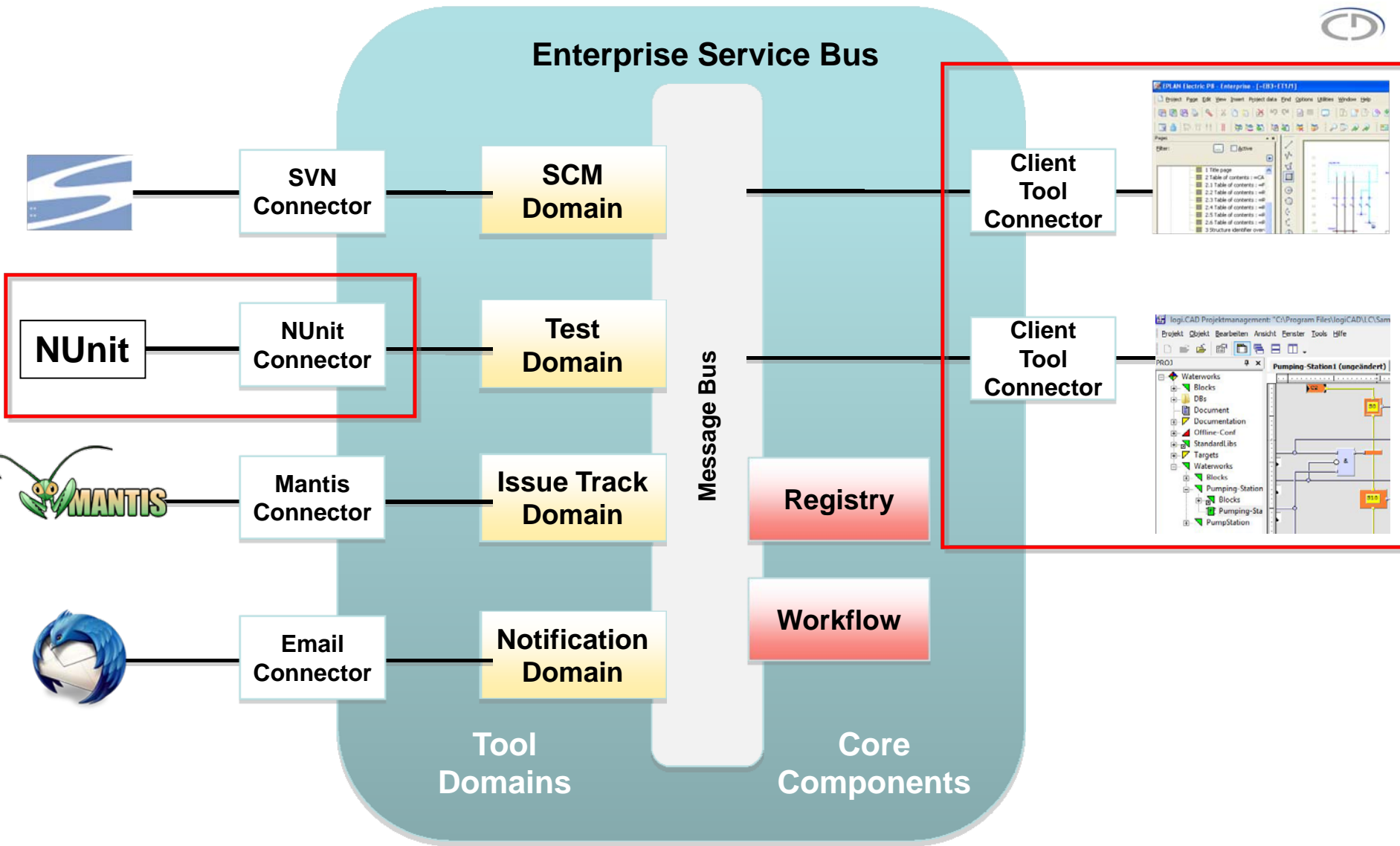


- **Software defect detection and prediction** methods and models
- Value- and risk-based **software test planning**
- **Test-first software** development for automation systems
- Test management & simulation for **production automation system**

Research Approach – Automation Service Bus

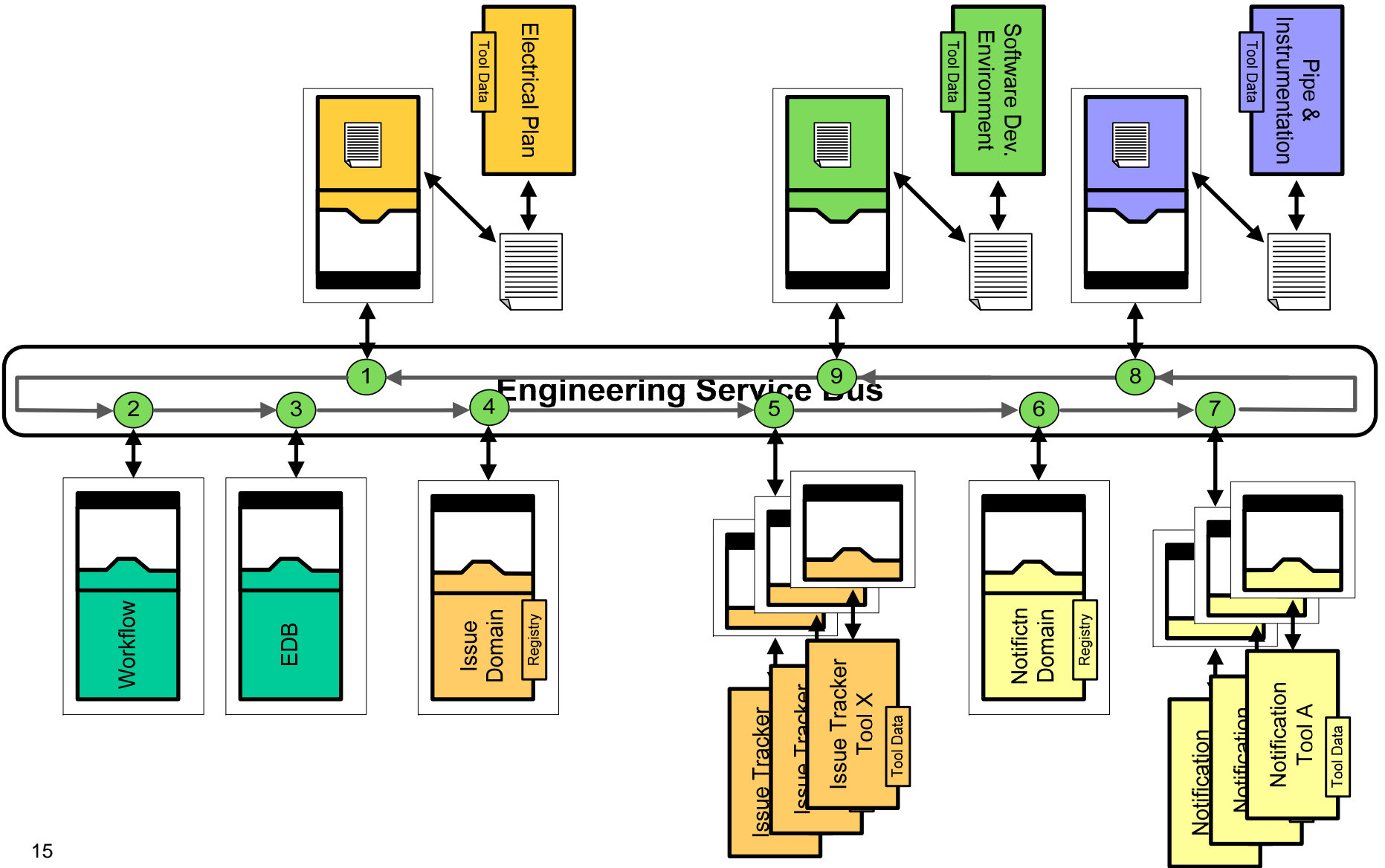


Solution Approach



OpenEngSB.org Middleware

Use Case: Andritz Hydro



Use Case: SE Dependency Management in Distributed Teams



Team Blue

Develops



Application A



Dependent on



Team Red

1 Test-Driven Development

2 Fast & Traceable Communication On Issues

Solution Approach Paradigms



- Open Standards/Protocols
 - Open Engineering Service Bus as Open Source Project
- Community Interaction
 - Engineering Communities
 - Open Source community
 - Research Communities
- Modularity
- Agility (Processes)
- Flexibility (Tools/Processes)

- Three levels of security integration
 1. Control: Service/User Access Control
 2. Prevention: Detailed Risk/Threat Analysis, Message-Level Security
 3. Analysis of Tool/User Interaction Patterns

- Two Usage Scenarios
 - **One OpenEngSB** Instance
 - **Multiple OpenEngSB** Instances connected via bridges (Bridge-Security)

Position of the Research Group in the International Context (Techn. Integration)



*The research group is a **rare case of collaboration** of software engineers and industrial automation systems engineers.*

Related research initiatives for cooperation and comparison of results

- **Socrates: Service-oriented approach** to integrating operational multi-vendor automation systems components.
- **Virtual Automation Network: homogeneous communication infrastructure for multi-site production facilities.**
- **Eclipse Jazz/ALF: Application Life cycle Management Frameworks.**

- **Tool integration across engineering domains**

- **Foundation to improve**
 - **Engineering processes**
 - **Process analysis and improvement**
 - **Defect detection**

- **Kernel and concepts: open source/protocol**

- **Univ.Ass. Institut Softwaretechnik & interaktive Systeme**
- **<http://www.schatten.info>**
- **Forschungs- und Anwendungsgebiete**
 - Software Engineering
 - Open Source Technologien (Java)
 - E-Commerce & Enterprise Architectures
 - Event-Driven Systems
- **Kooperationen:**
 - Frequentis (Semantische Datenintegration & Optimierung)
 - Österr. Computer Gesellschaft, Leitung des Open Source Arbeitskreises, Mitorganisator Informatik
 - Consulting, Training, Vorträge (Kunden u.a. IBM, GFT, VOEST Linz, CSC, IQSoft, Softwarepark Hagenberg, Landesregierung Salzburg, Joyn IT, Steiner-HiTech, Erste Bank Leasing, Indoqa, LOVO, ...)
 - MTel Bulgarien (Mobilkom Tochter)
 - TU Prag; Department of Cybernetics; Prof. Marik

