Dr.-Ing. Rainer Drath, ABB Corporate Research Center Ladenburg

Lets talk AutomationML Teil II

A concept to achieve iterative interoperability between engineering tools in a heterogeneous tool landscape

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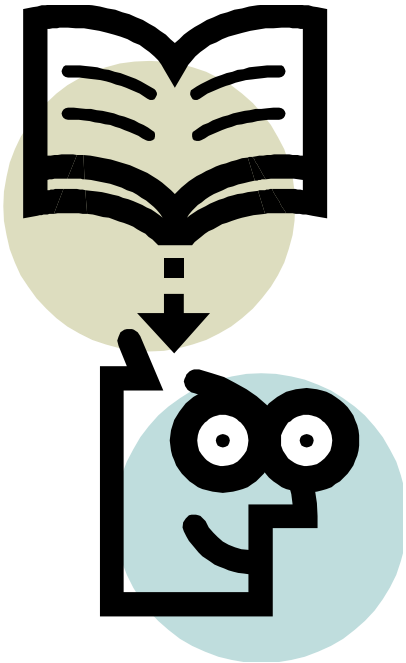
Heterogeneous Tool Landscape
Some Terms



- **Heterogeneous tool landscape** = variety of independent tools
- „**Interoperability**“ describes the ability of engineering tools to interact with each other
- **Simple case**: one shot file exchange
- **Reality**: iterative file exchange, data exchange exchange with loops (unsolved today9

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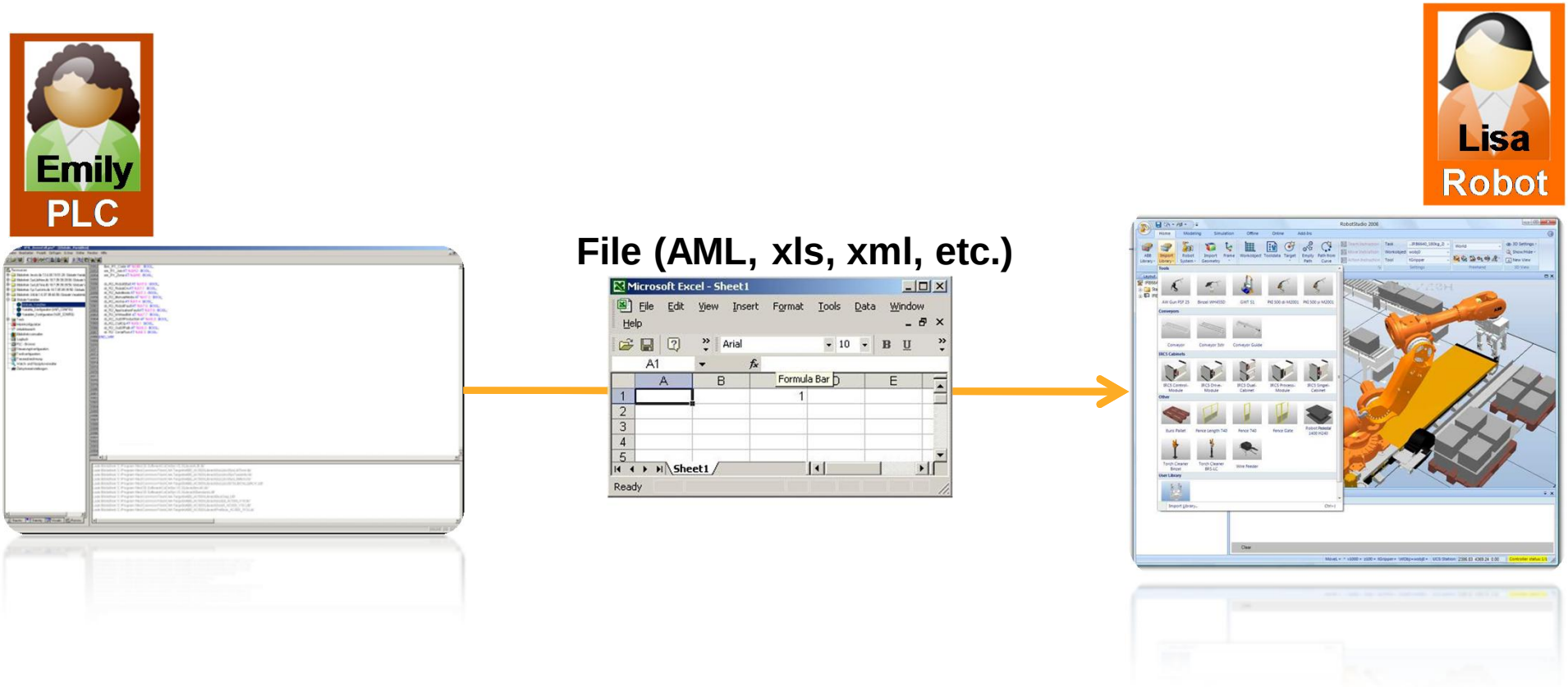
Introduction
Typical situation in file based data exchange



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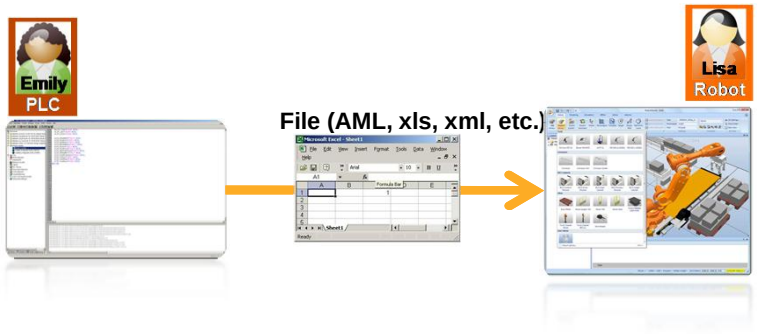
Introduction
Typical situation in file based data exchange



- No change management
- No change tracking
- No version management
- No transparency
- Unknown responsibility for the data.
- Unknown rights to perform changes.
- Danger of branching.
- No substription functionality.

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Question

How can the matching of engineering data across tools be achieved in a computer supported, systematic and reproducible way?

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Precondition 1

Collaboration Functionality

AutomationML is not a tool and does not provide any functionality.

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Precondition 1
Collaboration Functionality

The engineering tools

… should remain independent

… should not know the data models of the other tools

Hence, we need a middleware software.

The middleware software …

… should be simple

… provide collaboration ***functionality***

mediate and exchange data

change management

tracking of responsibilities

… should work independent from the tools

… should provide means for connection of further tools

… should base on standard technologies

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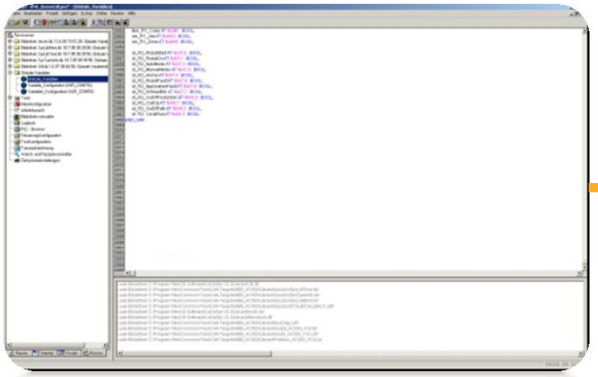
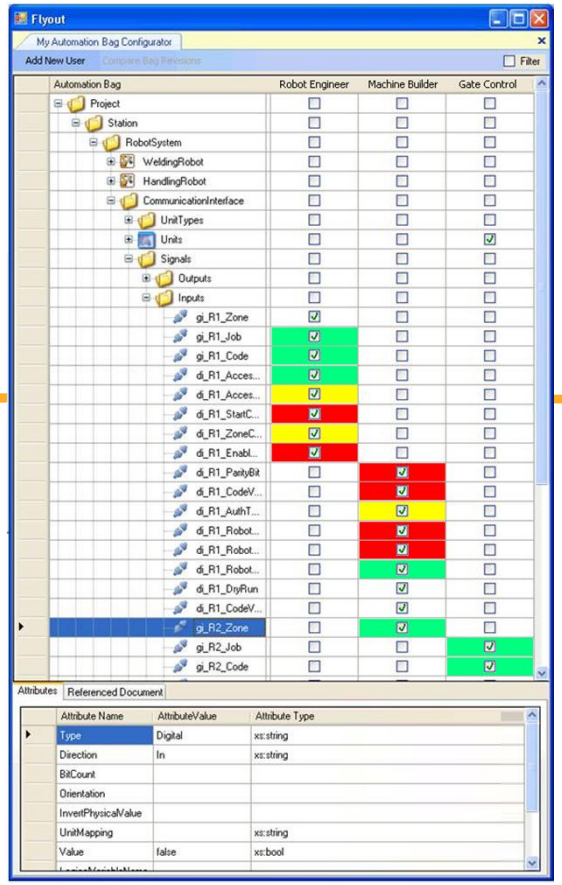
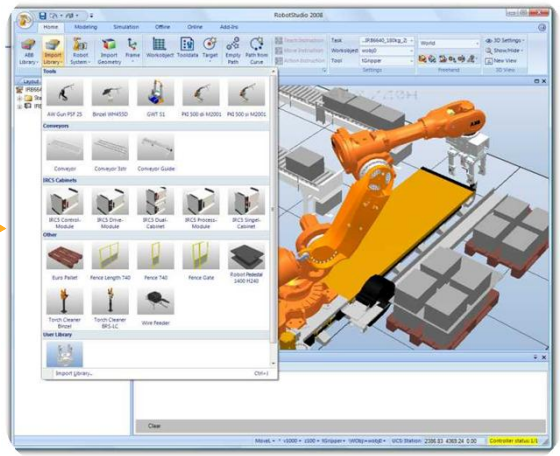
Major idea



Intermediate software





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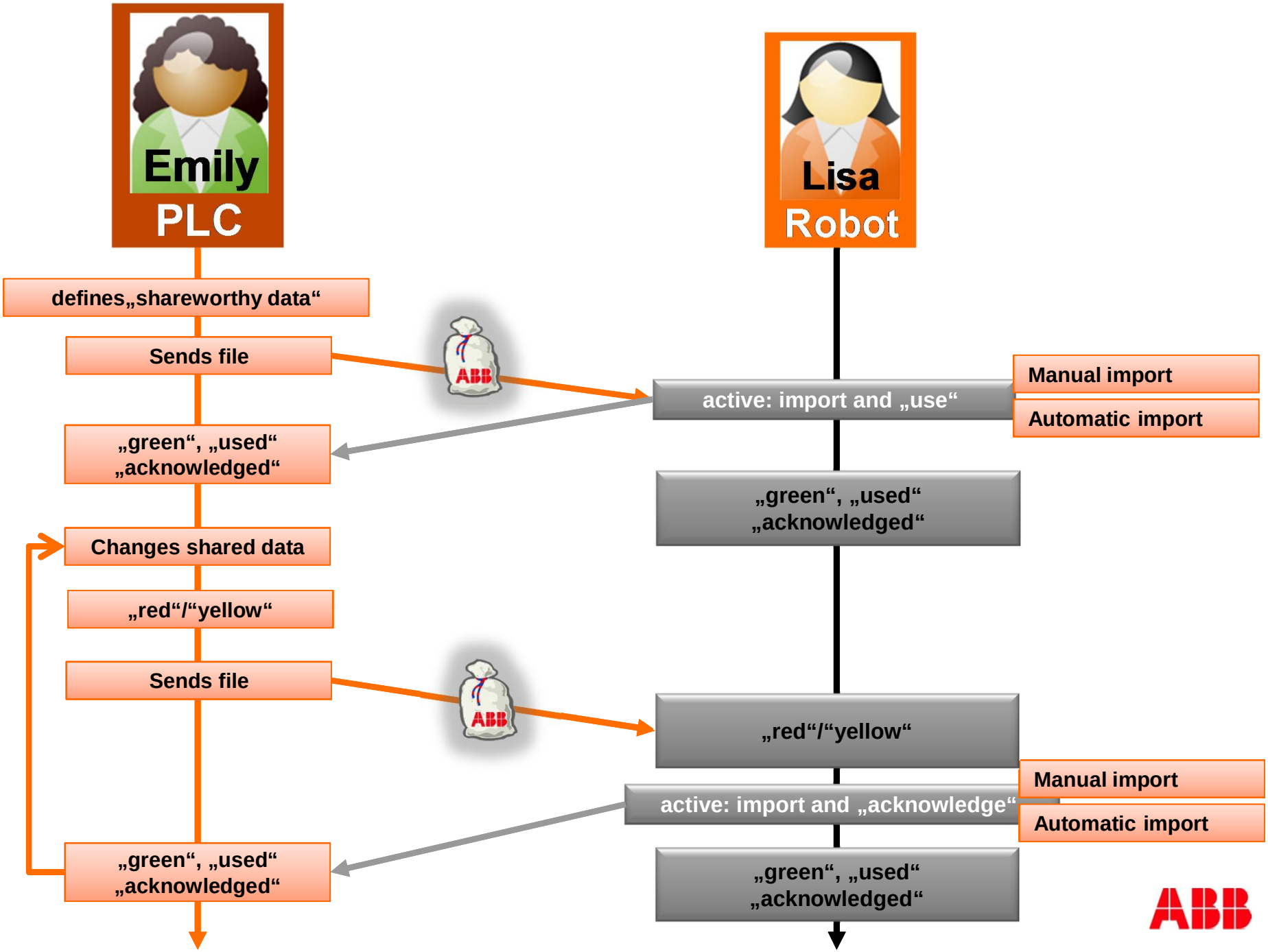
Workflow proposal

Idea…



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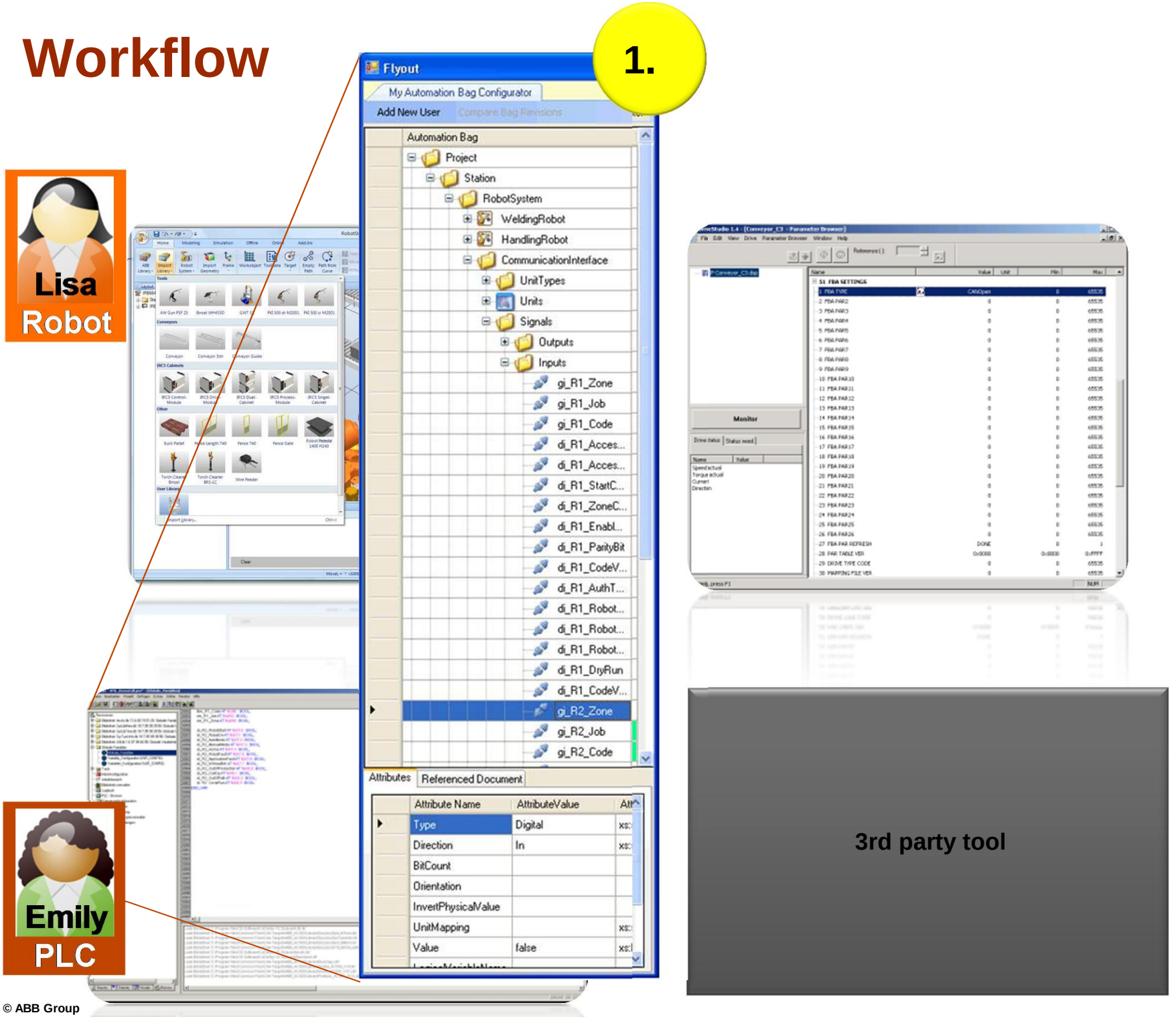
Tool proposal

Workflow



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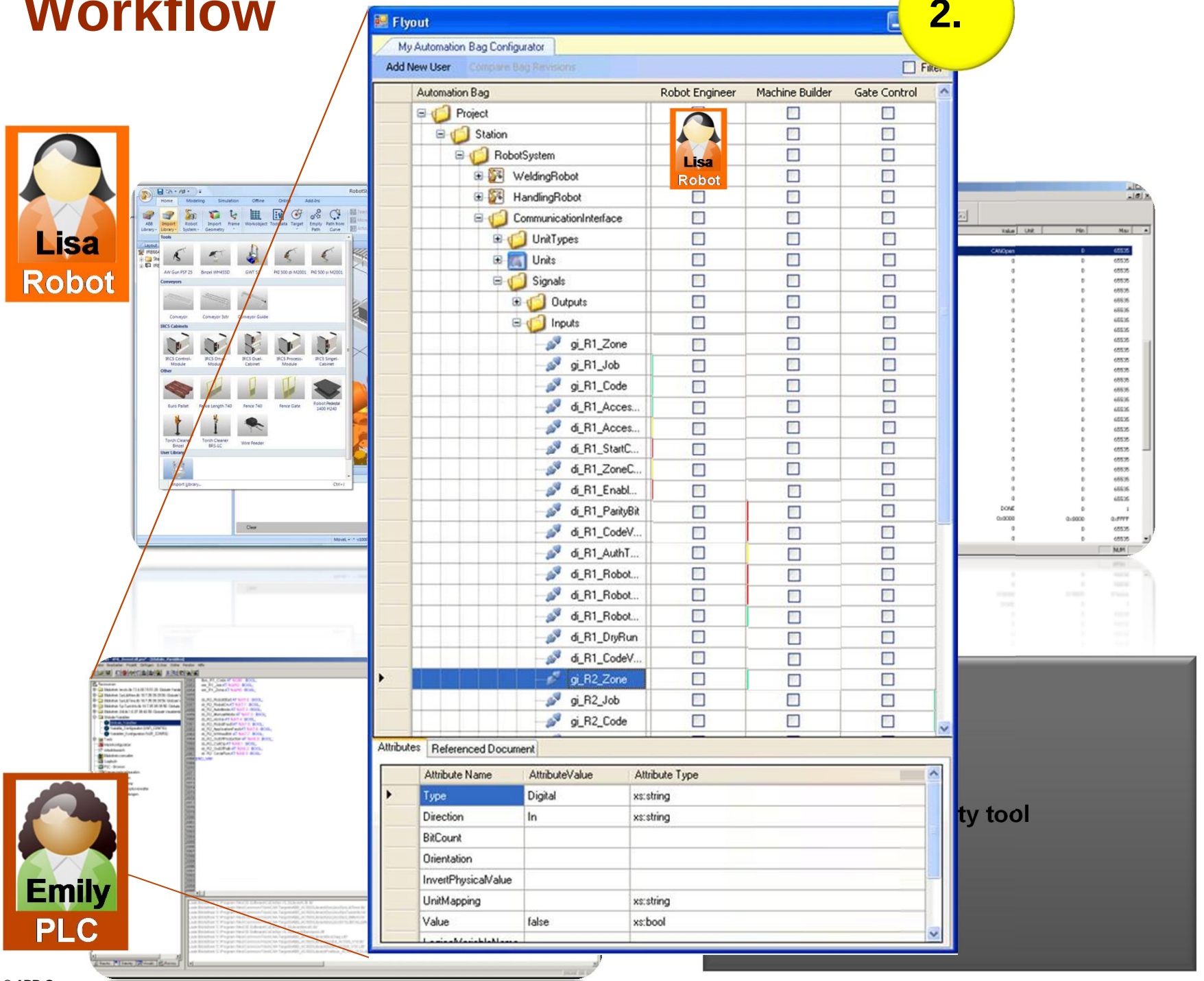
Workflow



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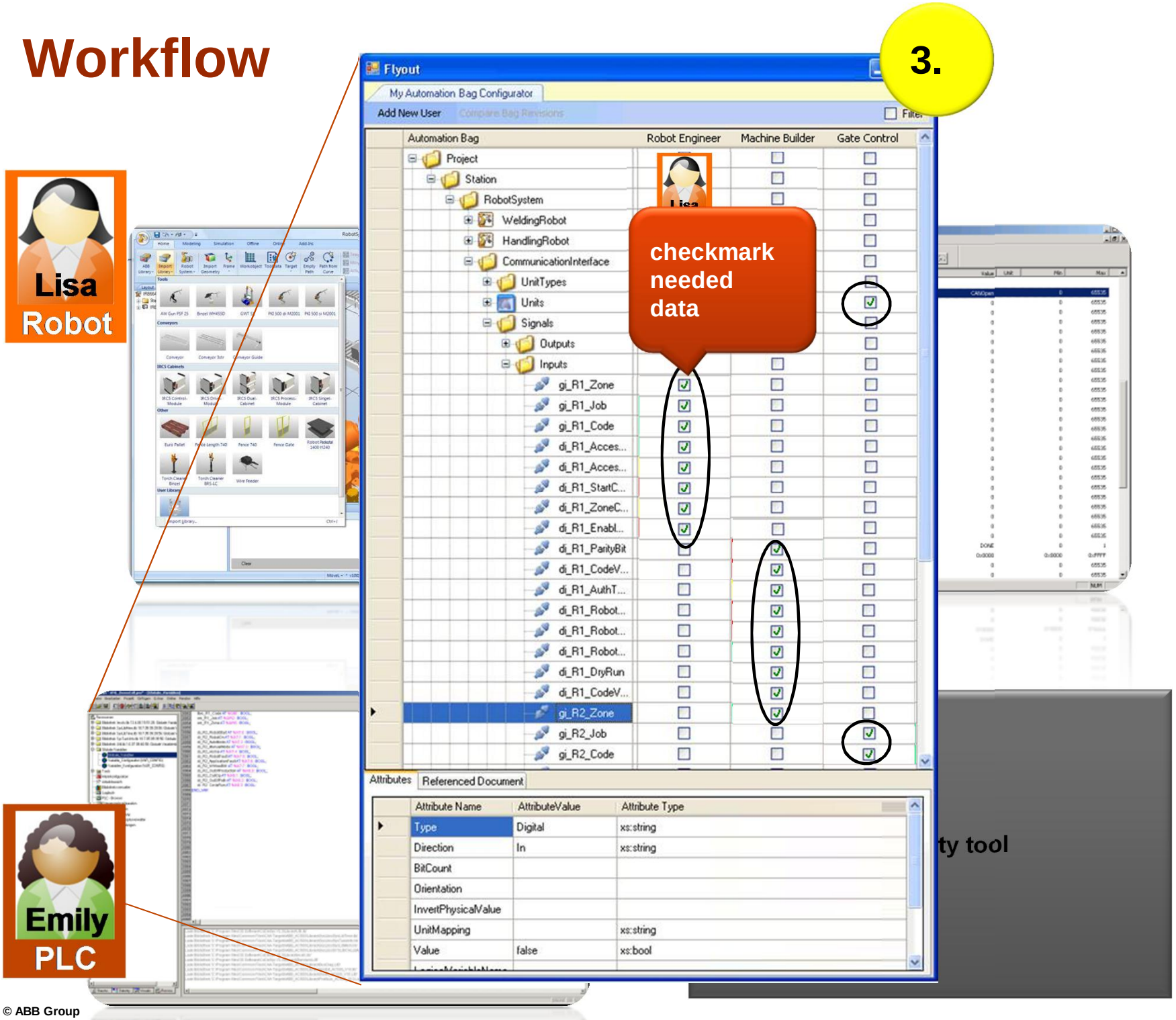
Workflow



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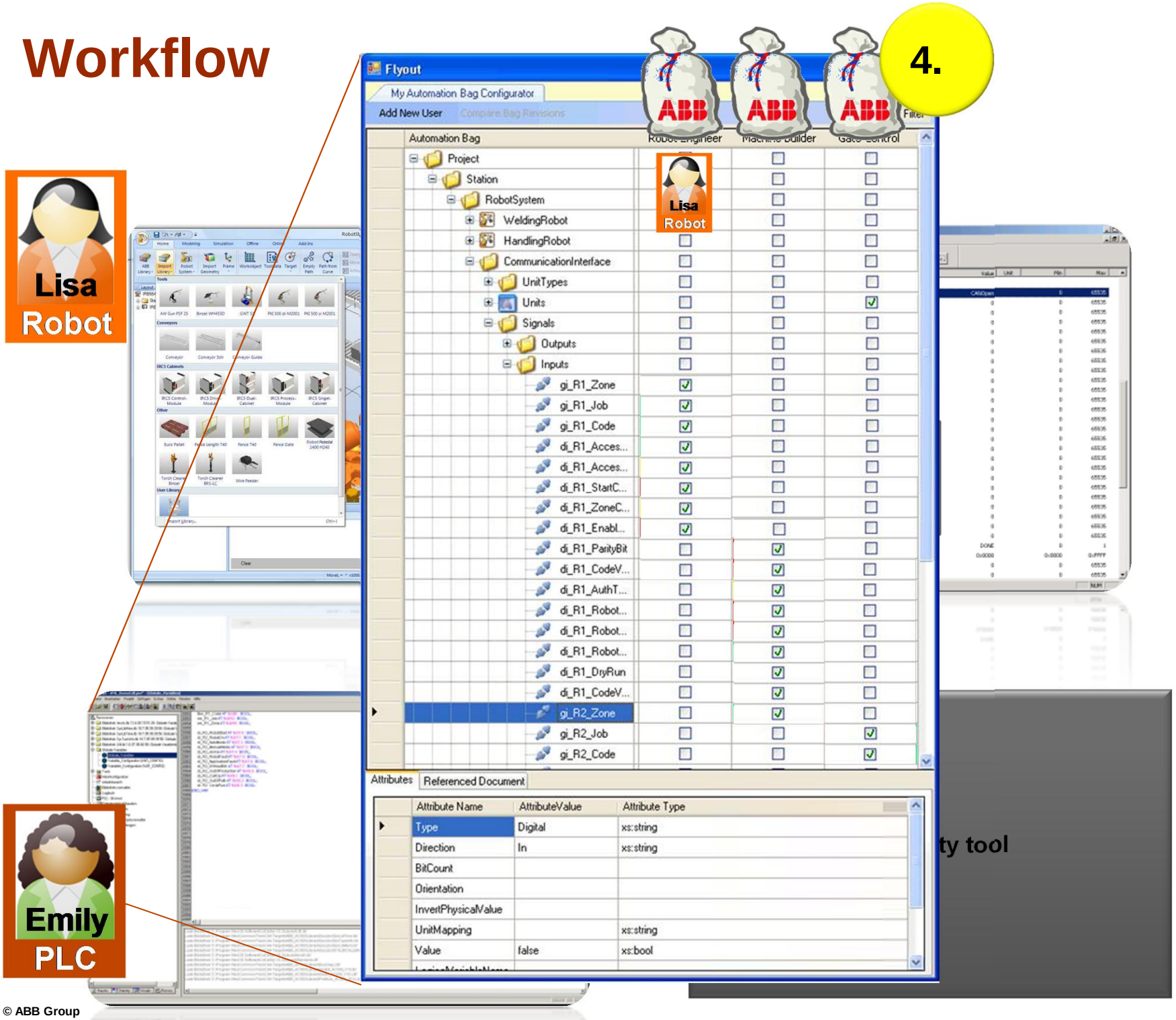
Workflow



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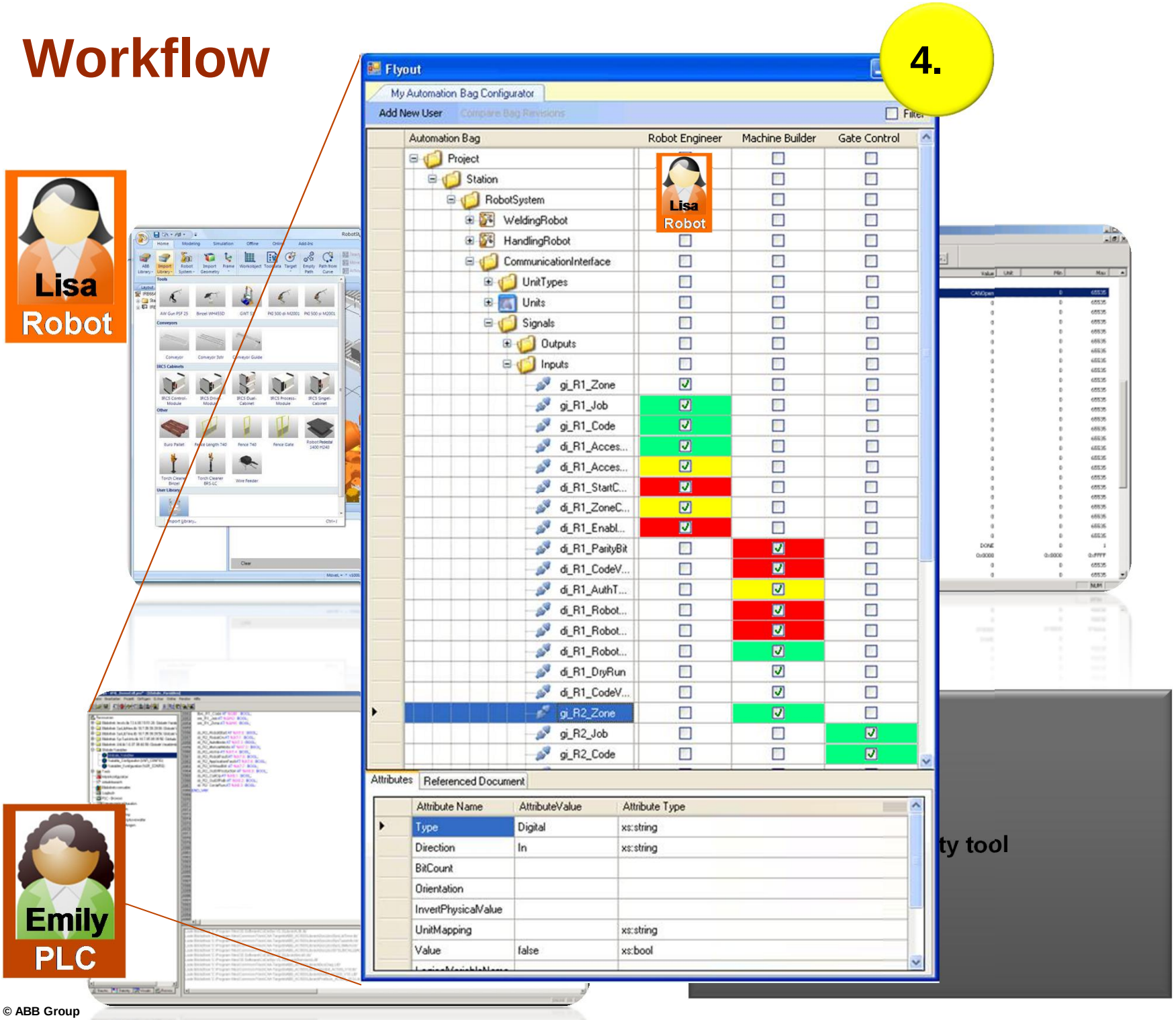
Workflow



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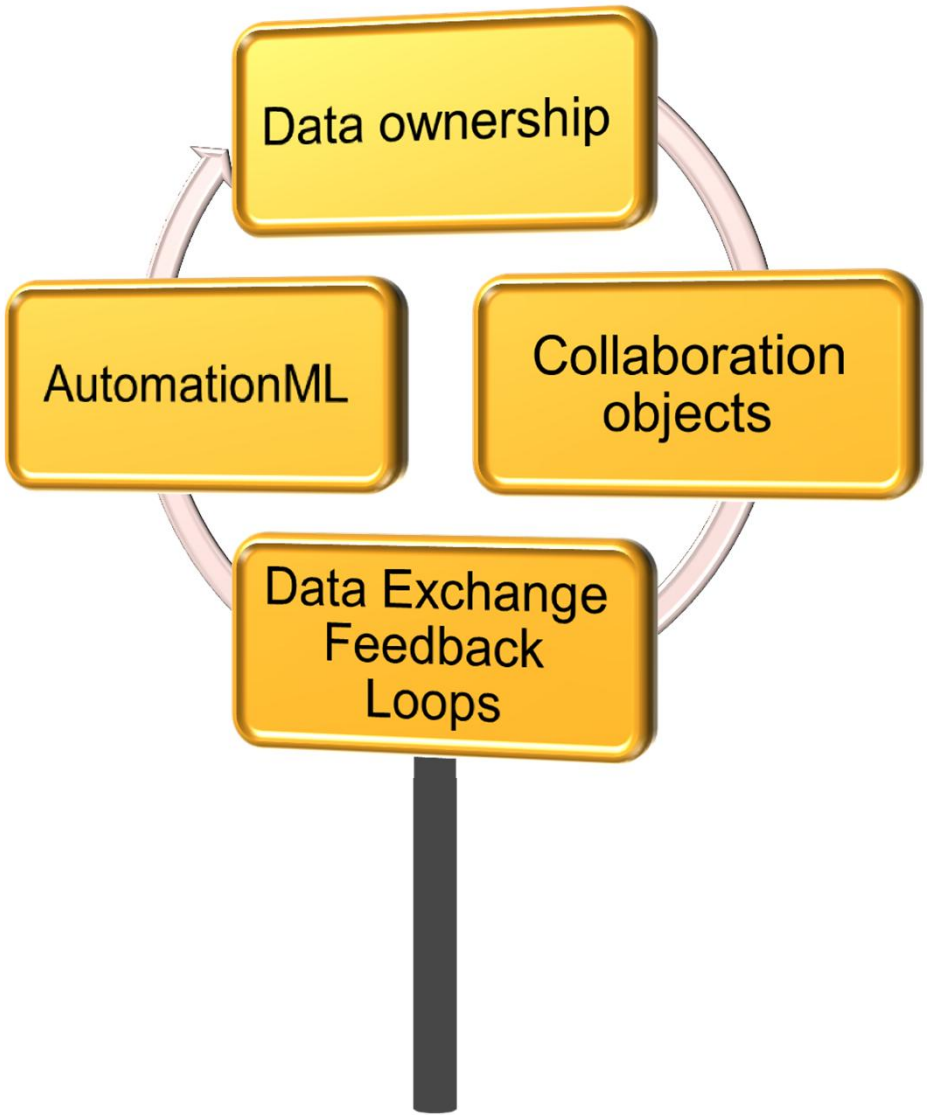
Underlying base concepts



Data ownership

- data belong to the „owner“
- data are only „lend“
- directed information flow

Collaboration objects

- Mini data model for engineering artifacts
- Efficient ratio between standardization effort and benefits

Data Exchange Feedback Loops

- Sends back: which data have been consumed really
- In case of changes: automatic detection of changes across consumed data
- Sends back: which changes are acknowledged?

AutomationML

- Basis for complex collaboration *functionality*

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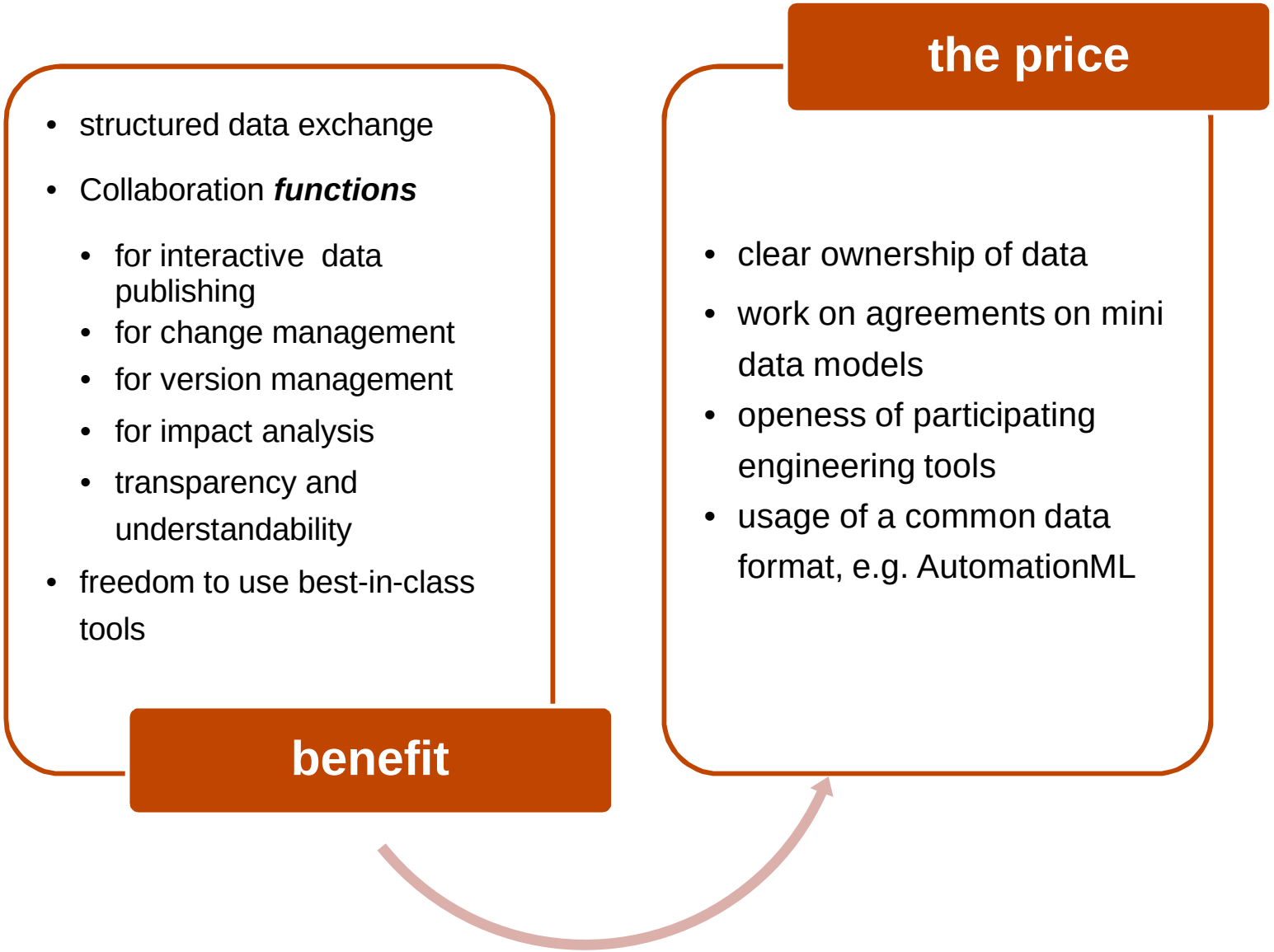
Effort - benefit



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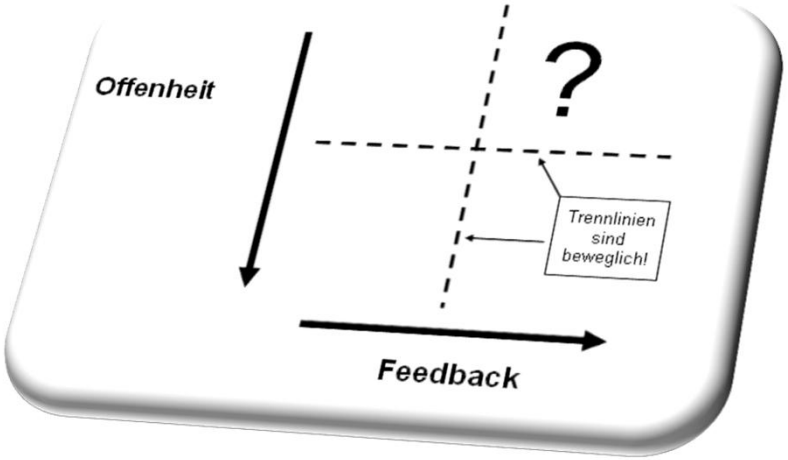
Precondition 2
Openess

- Engineering tools must be open enough!
  - How to objectively measure openess?
  - Which criteria?



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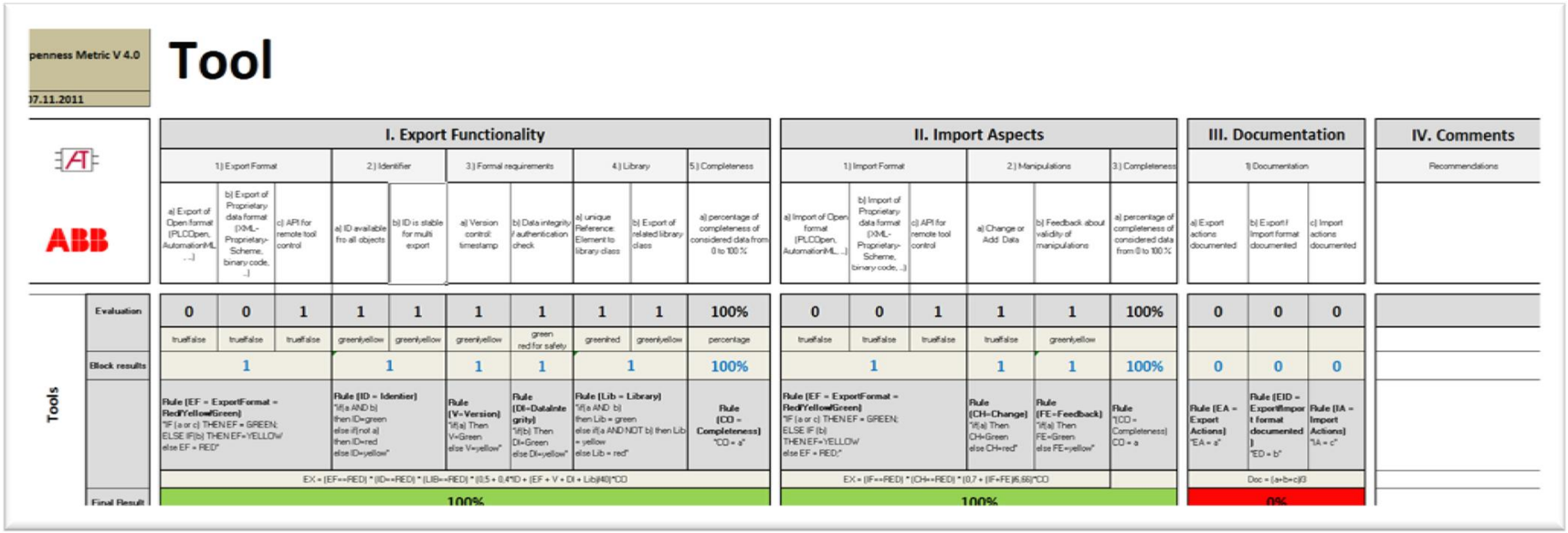
Solution 2
Openess metric



penness Metric V 4.0

07.11.2011

Tool

	I. Export Functionality										II. Import Aspects						III. Documentation			IV. Comments
	1) Export Format			2) Identifier		3) Formal requirements		4) Library		5) Completeness	1) Import Format			2) Manipulations		3) Completeness	1) Documentation			Recommendations
	a) Export of Open format (PLCOpen, AutomationML, ...)	b) Export of Proprietary data format (XML-Proprietary-Scheme, binary code, ...)	c) API for remote tool control	a) ID available fro all objects	b) ID is stable for multi export	a) Version control: timestamp	b) Data integrity / authentication check	a) unique Reference: Element to library-class	b) Export of related library class	a) percentage of completeness of considered data from 0 to 100 %	a) Import of Open format (PLCOpen, AutomationML, ...)	b) Import of Proprietary data format (XML-Proprietary-Scheme, binary code, ...)	c) API for remote tool control	a) Change or Add Data	b) Feedback about validity of manipulations	a) percentage of completeness of considered data from 0 to 100 %	a) Export actions documented	b) Export / Import format documented	c) Import actions documented	
Tools – Evaluation	0	0	1	1	1	1	1	1	1	100%	0	0	1	1	1	100%	0	0	0	
	true/false	true/false	true/false	green/yellow	green/yellow	green/yellow	green: red for safety	green/red	green/yellow	percentage	true/false	true/false	true/false	true/false	green/yellow					
Block results	1			1		1	1	1		100%	1			1	1	100%	0	0	0	
	Rule (EF = ExportFormat = Red/Yellow/Green) "IF (a or c) THEN EF = GREEN; ELSE IF(b) THEN EF=YELLOW else EF = RED"			Rule (ID = Identier) "if(a AND b) then ID=green else if(not a) then ID=red else ID=yellow"		Rule (V=Version) "if(a) Then V=Green else V=yellow"	Rule (DI=DataIntegrity) "if(b) Then DI=Green else DI=yellow"	Rule (Lib = Library) "if(a AND b) then Lib = green else if(a AND NOT b) then Lib = yellow else Lib = red"		Rule (CO = Completeness) "CO = a"	Rule (EF = ExportFormat = Red/Yellow/Green) "IF (a or c) THEN EF = GREEN; ELSE IF (b) THEN EF=YELLOW else EF = RED;"			Rule (CH=Change) "if(a) Then CH=Green else CH=red"	Rule (FE=Feedback) "if(a) Then FE=Green else FE=yellow"	Rule "(CO = Completeness) CO = a	Rule (EA = Export Actions) "EA = a"	Rule (EID = Export/Import format documented) "ED = b"	Rule (IA = Import Actions) "IA = c"	
	EX = (EF==RED) * (ID==RED) * (LIB==RED) * (0,5 + 0,4*ID + (EF + V + DI + Lib)/40)*CO										EX = (IF==RED) * (CH==RED) * (0,7 + (IF+FE)/6,66)*CO						Doc = (a+b+c)/3			
Final Result	100%										100%						0%			

See workshop „Hands on – Tipps für Programmierer von Exportern und Importern“ 10.05.2012, 9:00-10:30 / repeated at 10:30-12:00

Or visit our publication at „Automation Kongress“ (Baden-Baden) 13.+14. Juni 2012, Fay, Drath, Barth, et. al.: Bewertung der Fähigkeit von Engineering-Werkzeugen zur Interoperabilität mit Hilfe einer Offenheitsmetrik

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Question

How can the matching of engineering data across tools be achieved in a computer supported, systematic and reproducible way?

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Summary

Question

How can the matching of engineering data across tools be achieved in a computer supported, systematic and reproducible way?

Answer

- AutomationML is a profound base for file based data exchange with unique solutions for semantic variety
- The described concept provides powerful collaboration functionality needed for iterative engineering

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Don’t wait for semantic standards, just begin!

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