OPC UA DT
DATA MODELING AND CODE GENERATION USING PAPYRUS

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CLUSE, 29/03/2022

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3. Robotic Cell SysML Model
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INTRODUCTION

- There Is No Industrie 4.0 without OPC UA[1]

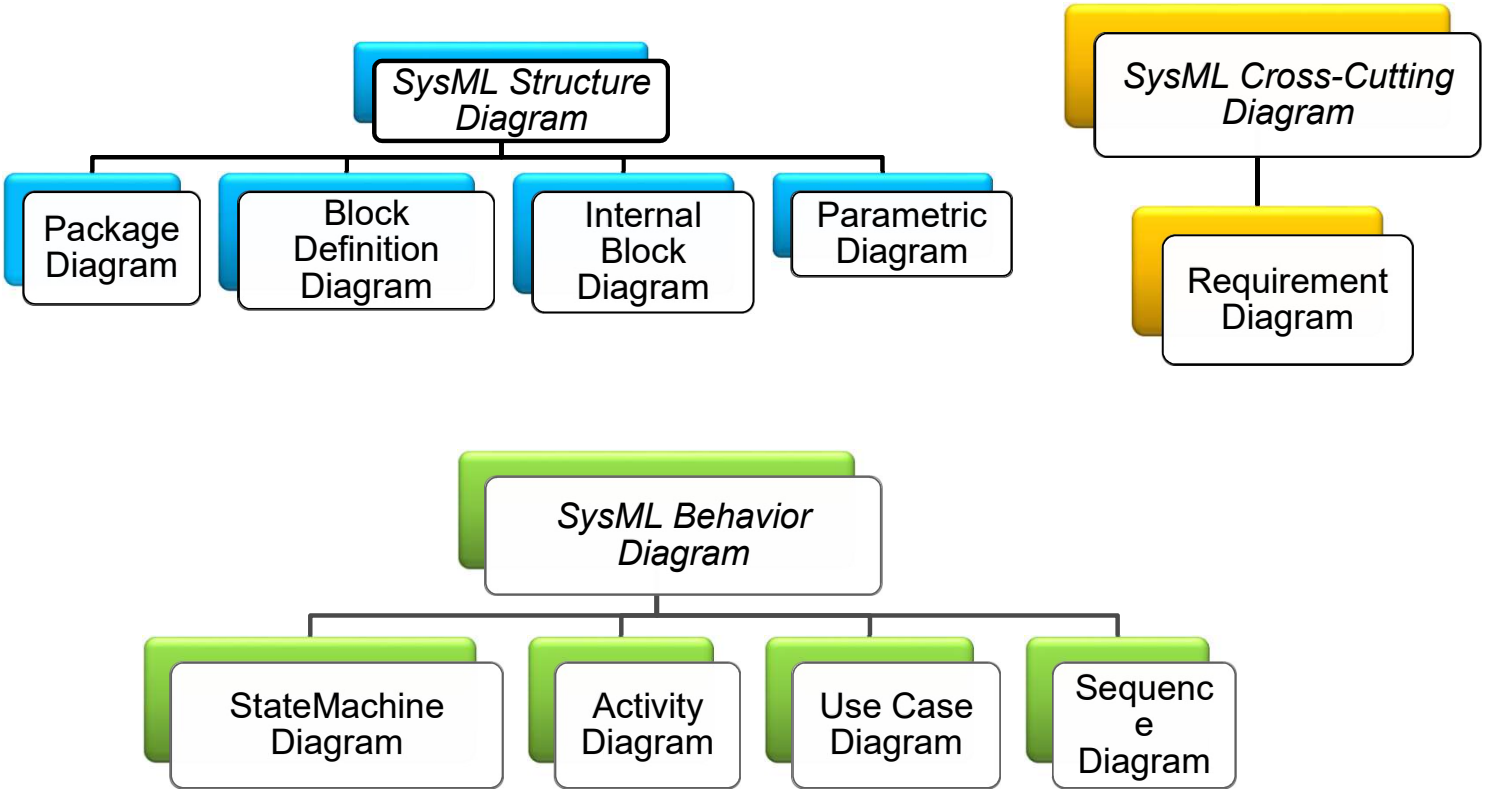
- Need for OPC UA CS for specific semantics description

- Need for model driven tools for fastening the deployment of Industry 4.0 compliant systems

→ Choice of SysML as a modelling language and Model2Model transformation for automating the deployment of OPC-UA Information models

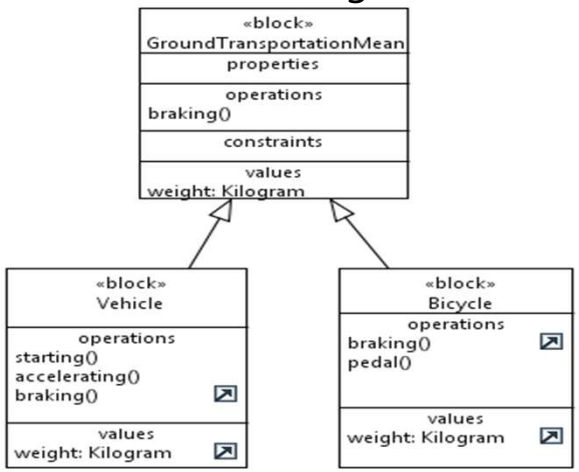
[1] Industry 4.0 and OPC UA: https://opcconnect.opcfoundation.org/2017/06/there-is-no-industrie-4-0-without-opc-ua/

SYSML DIAGRAMS

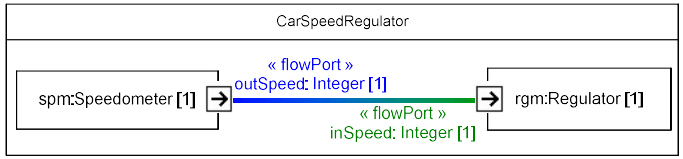


Multiple dedicated viewpoints

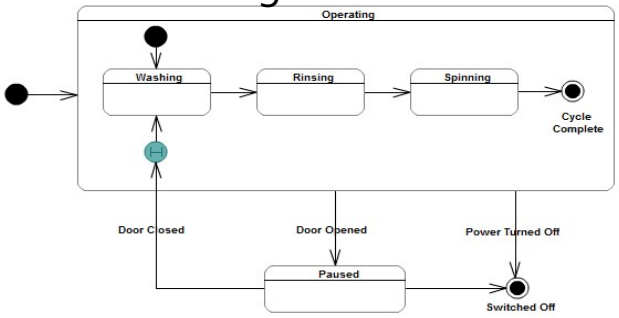
Block Definition Diagram



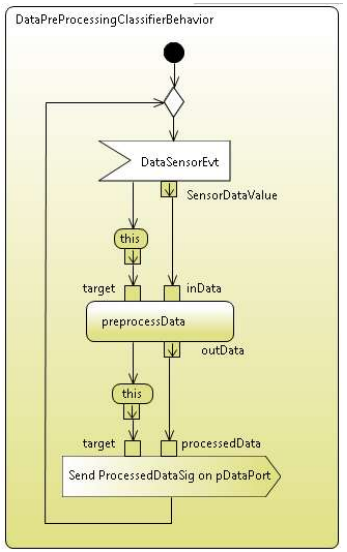
Internal Block Diagram



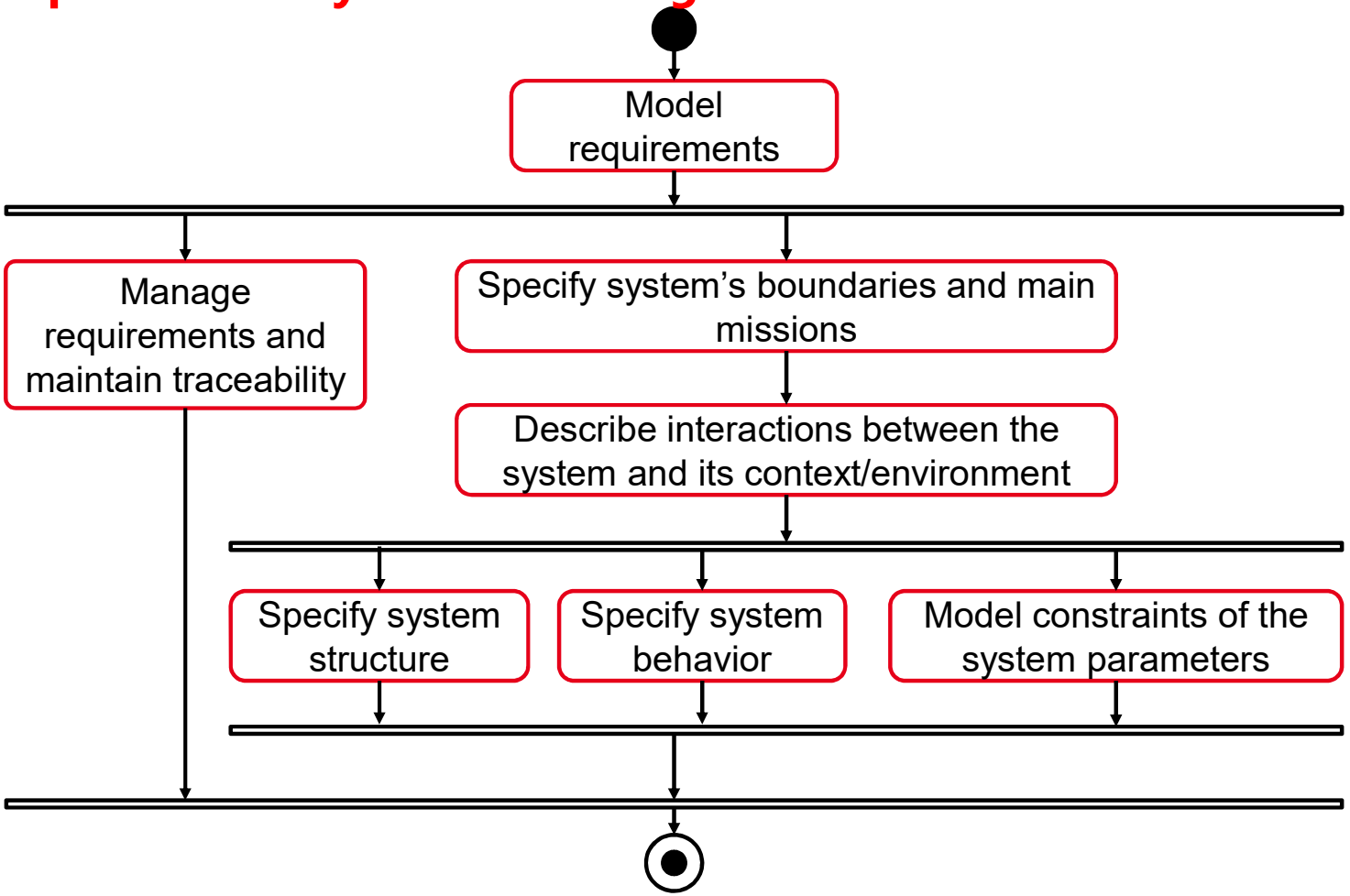
Statemachine Diagram



Activity Diagram



A process for system modeling



SysML for robotic cells modelling

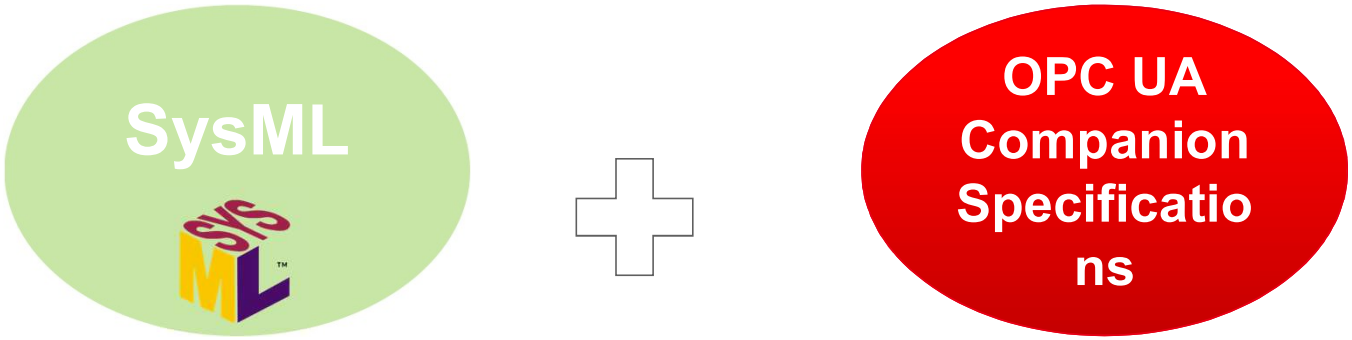
1. Specification:
   Use Case diagrams, Requirements diagrams

2. Functional Design:
   Structure: BDD, IBD
   Behavior: State Machine diagrams, activitiy diagrams, sequence diagrams

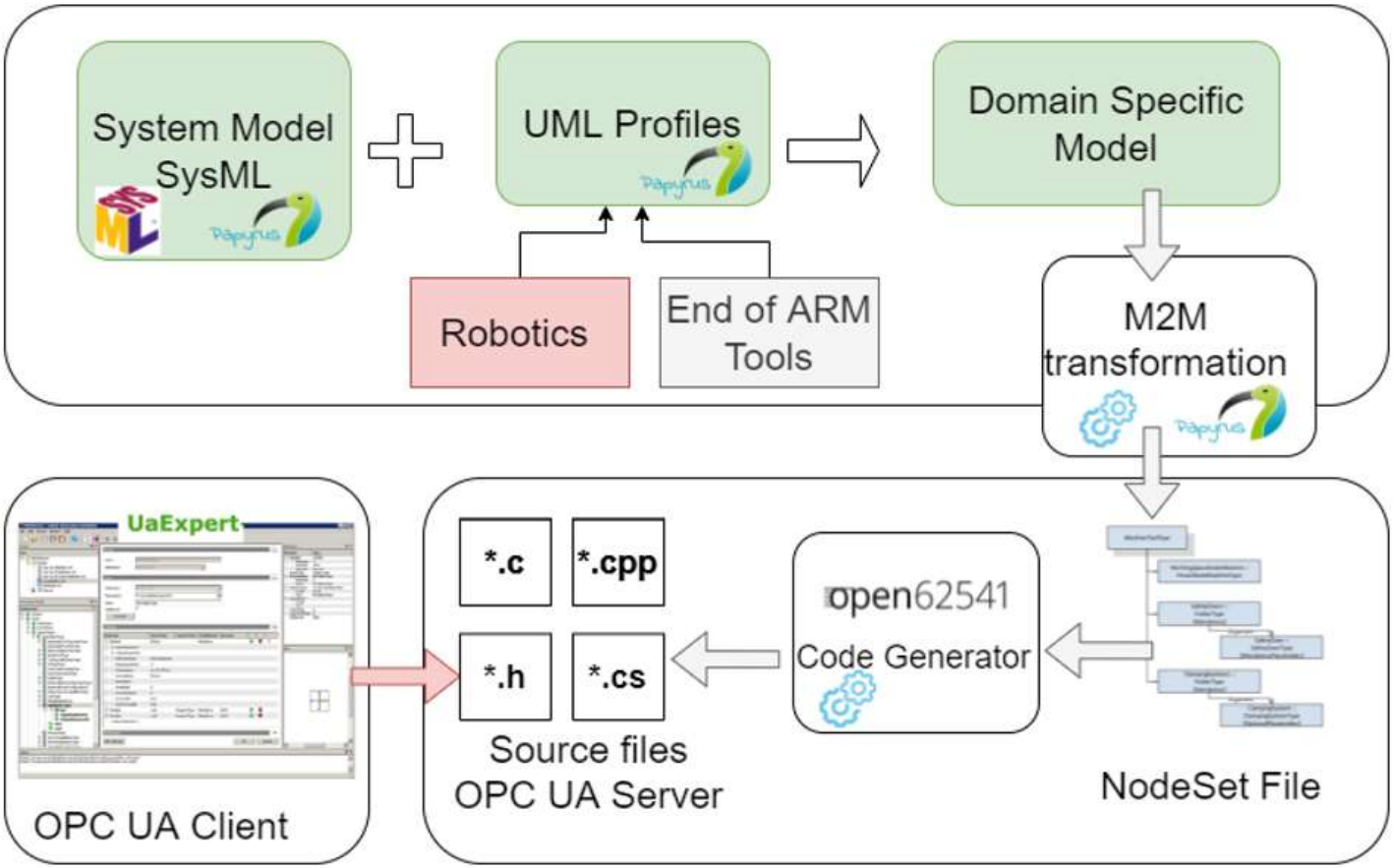
Extending SysML with Robotics Information Models

SysML Blocks are generic and do not contain meta data specific to robotic systems

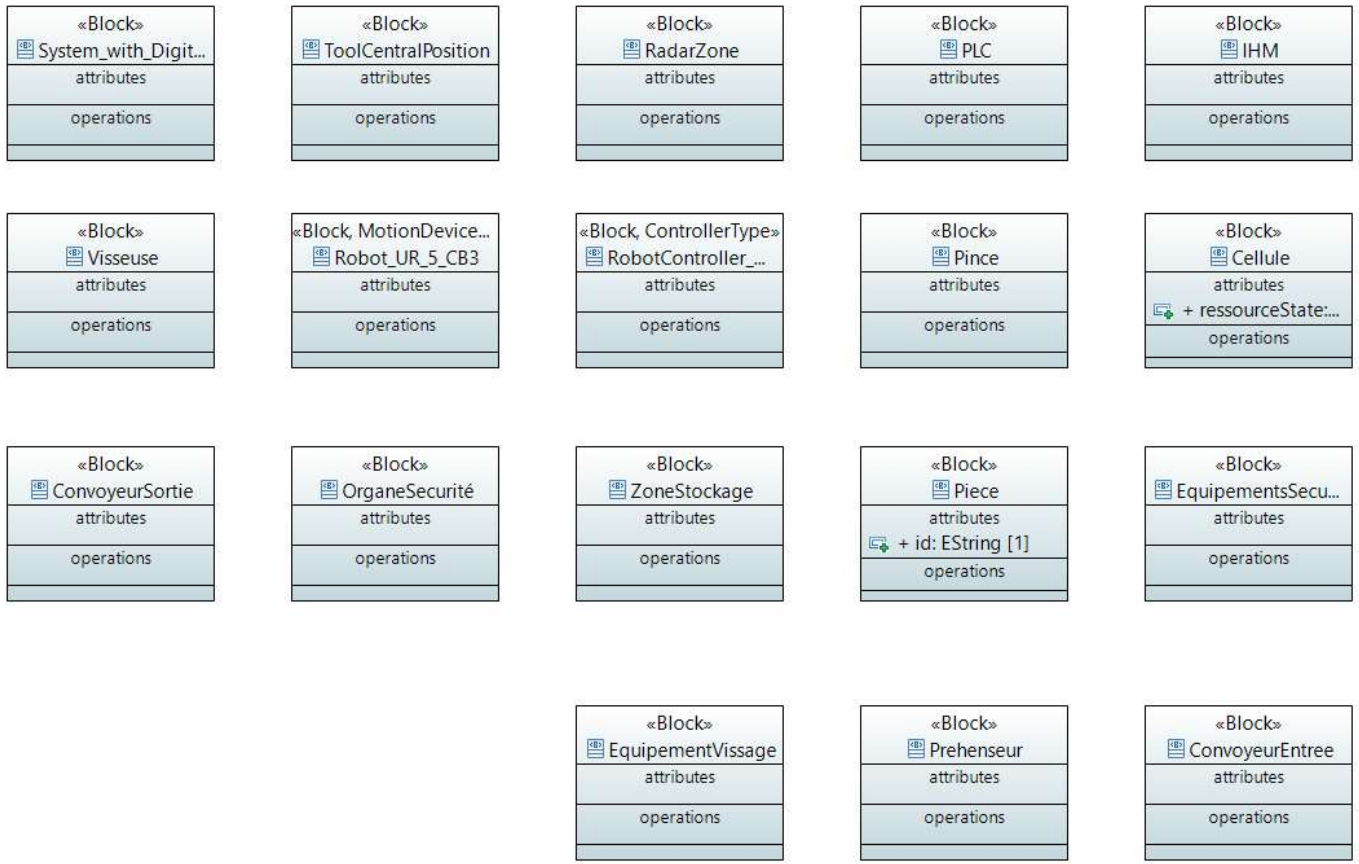
➡ **Extension of SysML by adding OPC-UA Companion Specifications as UML Profiles**



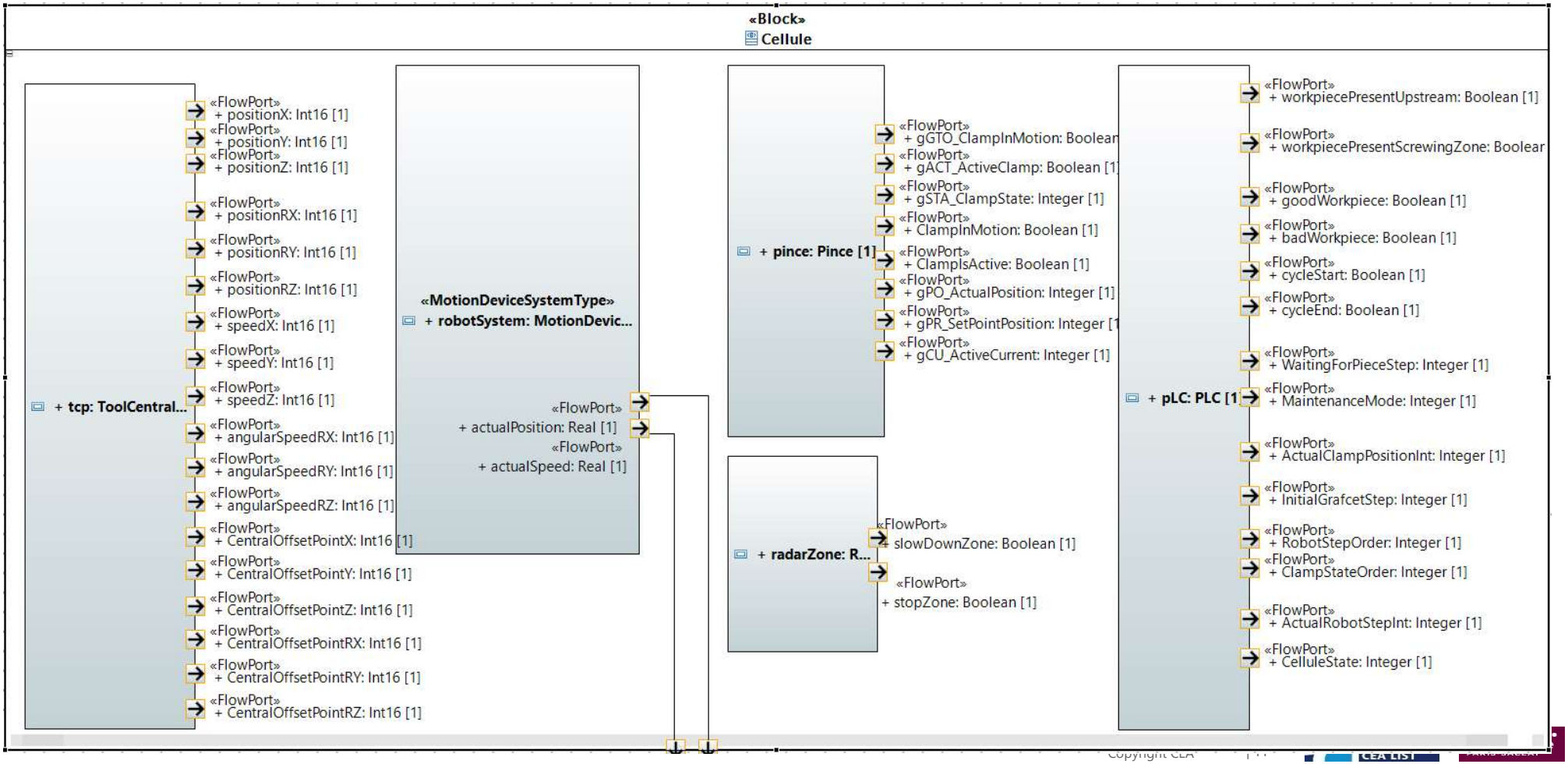
MODEL DRIVEN TOOL-CHAIN ARCHITECTURE



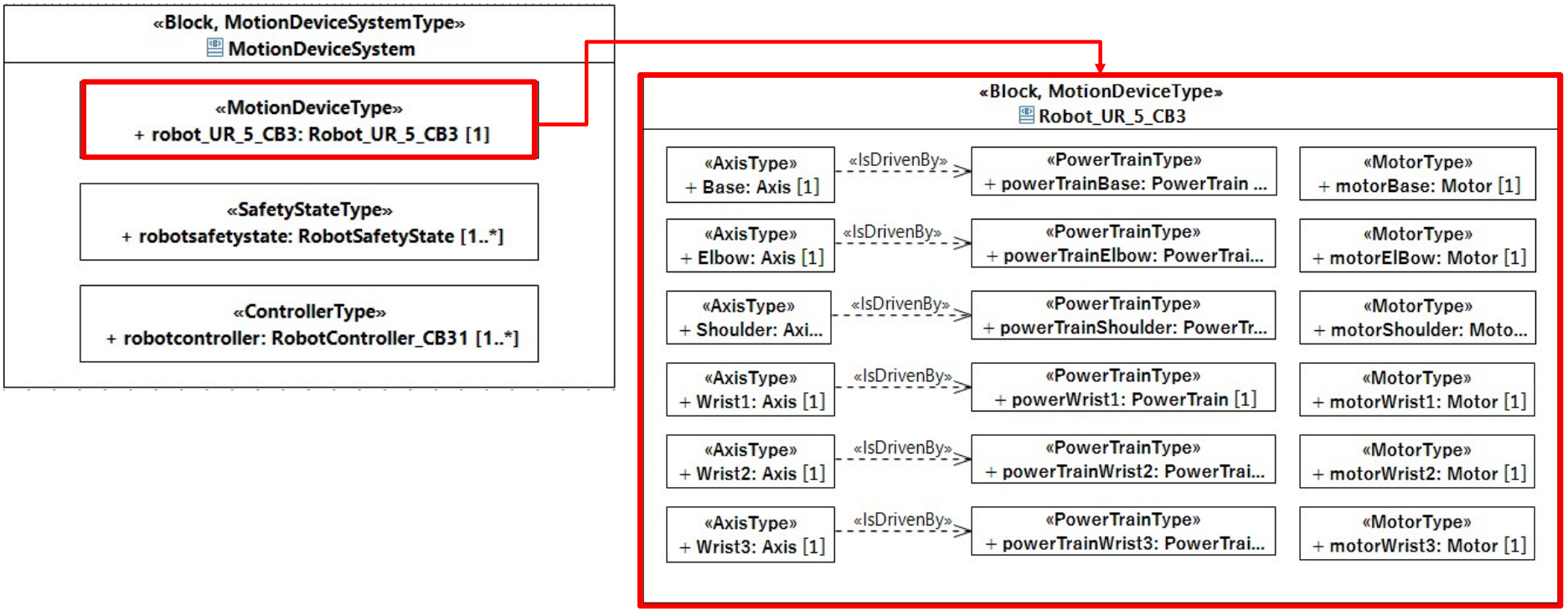
ROBOTIC CELL SYSML MODEL : BDD



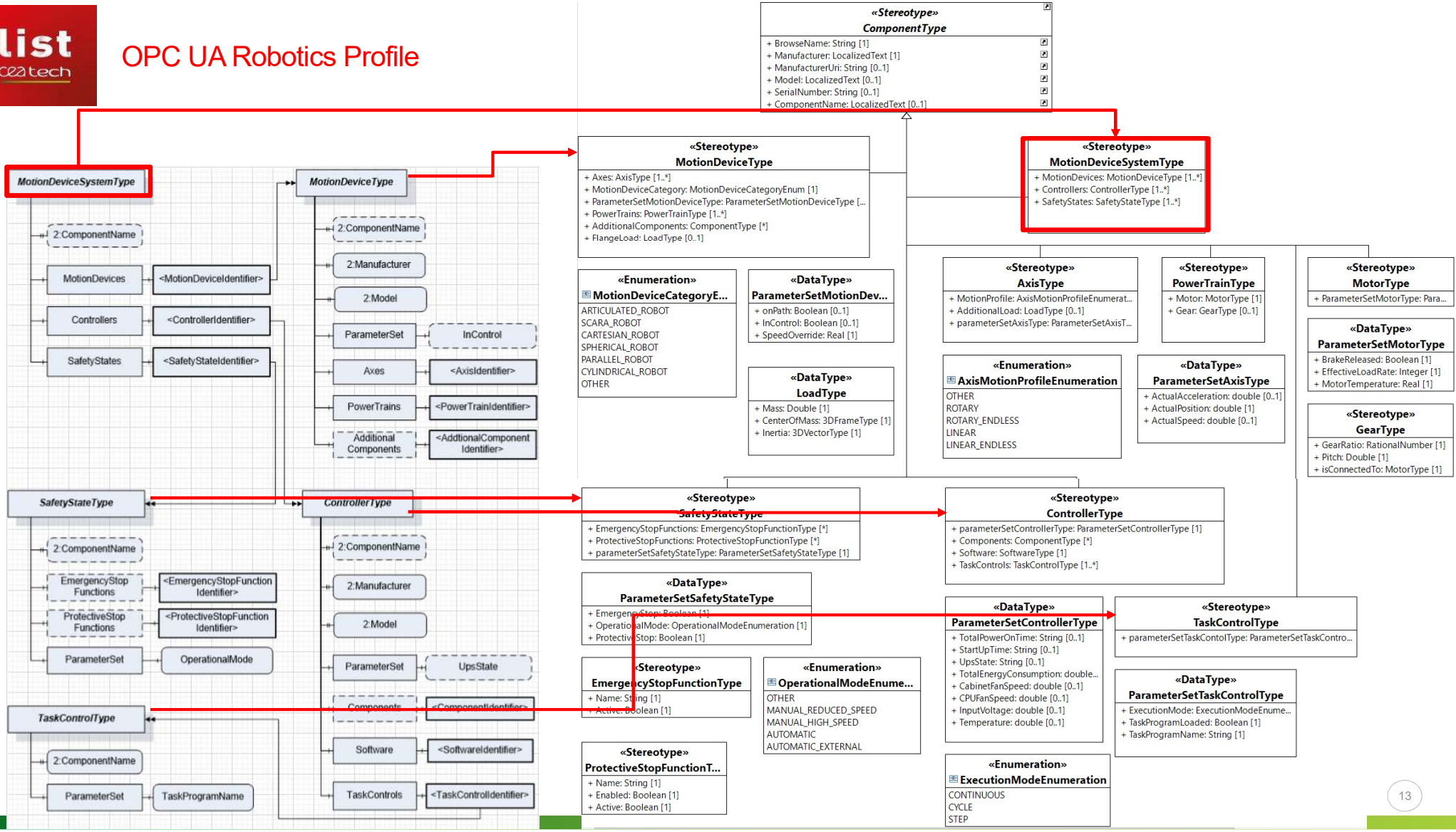
ROBOTIC CELL SYSML MODEL : IBD



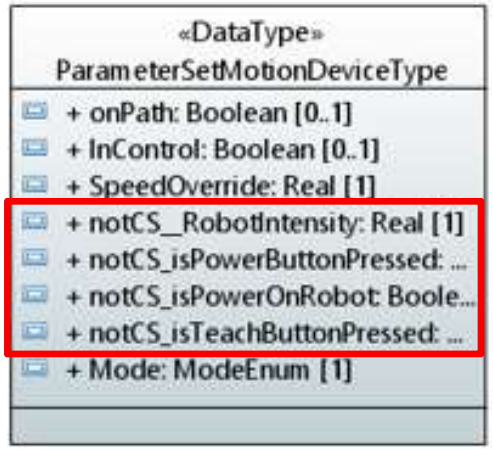
Motion Device System Model

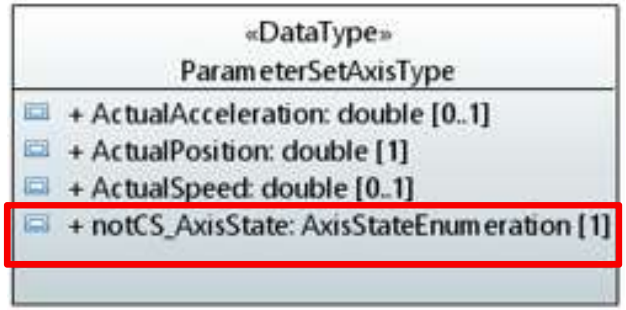


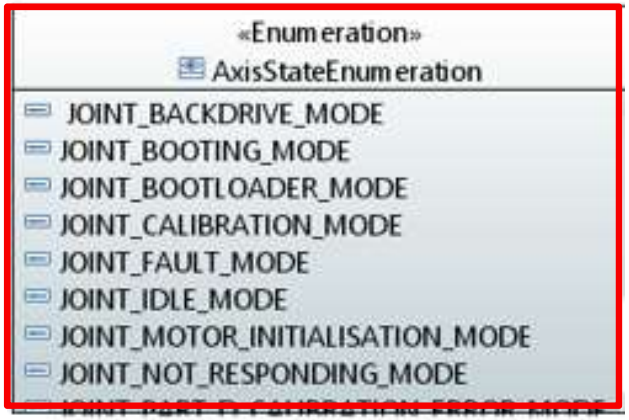
OPC UA Robotics Profile



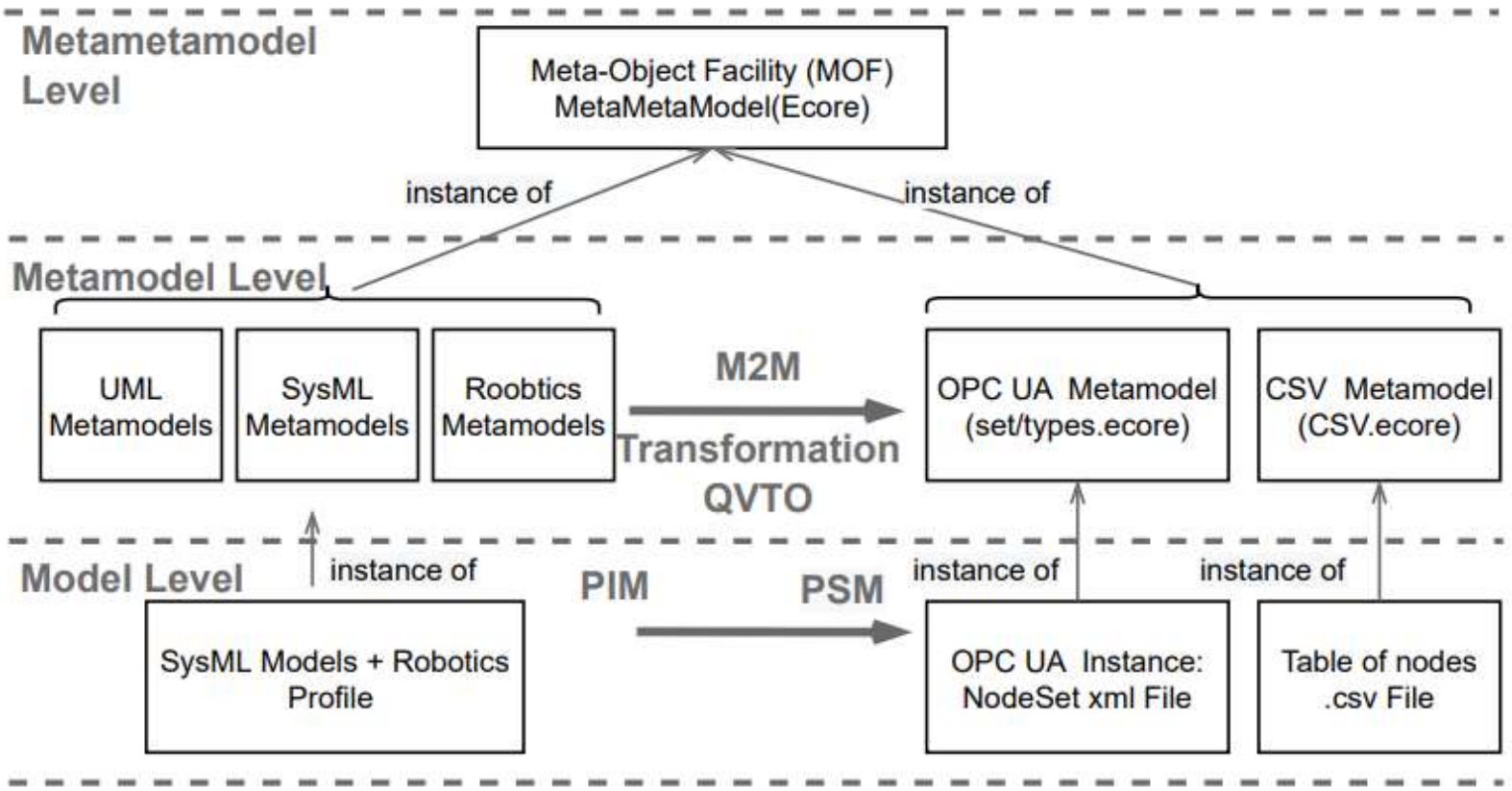
Add non existing information to the CS Robotics Profile



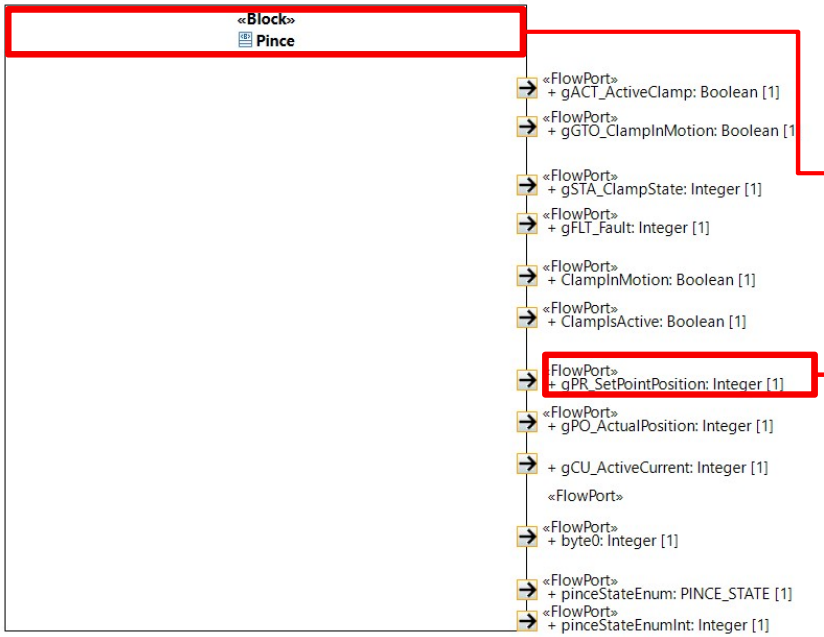




QVTo Transformation



Transformation of Blocks



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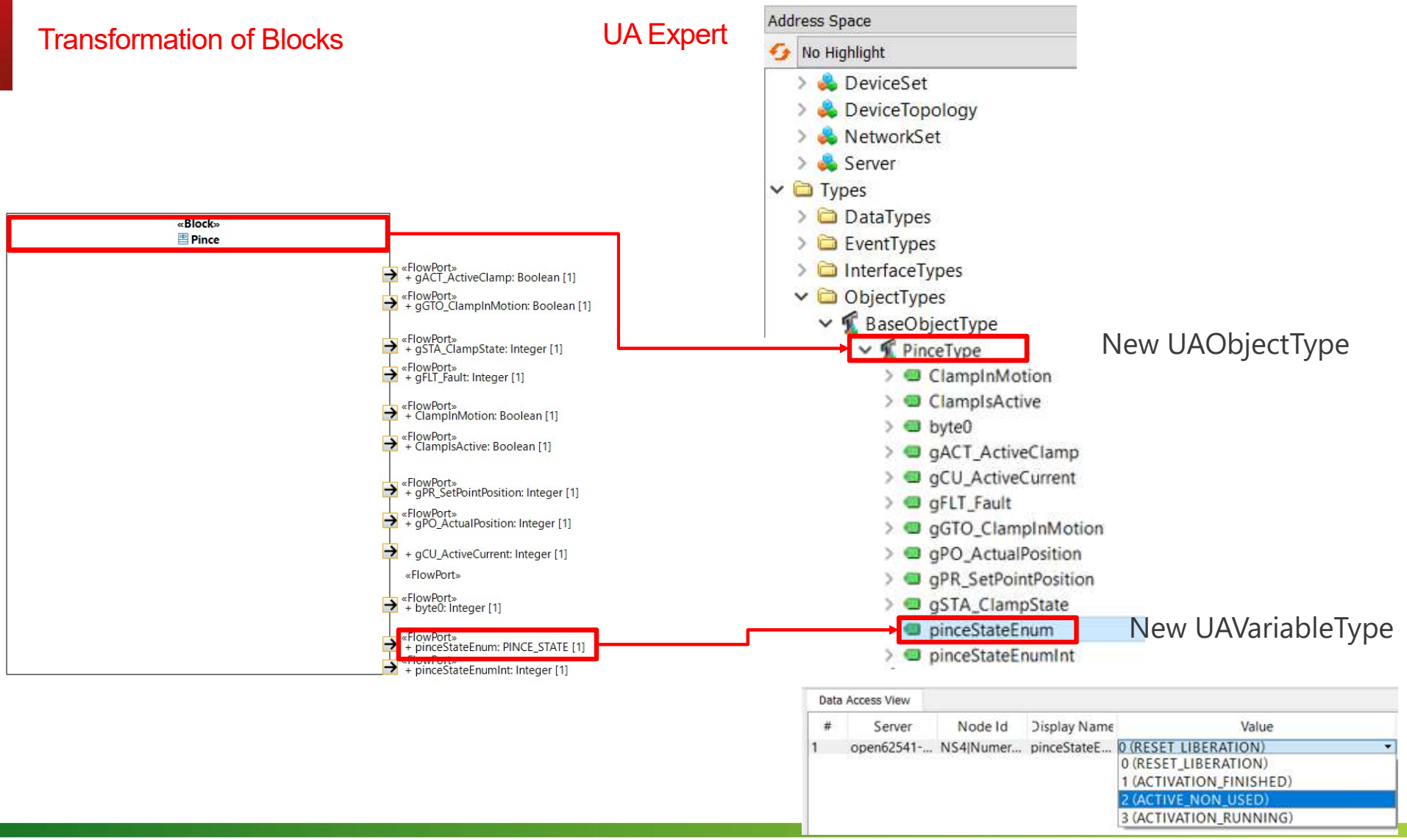
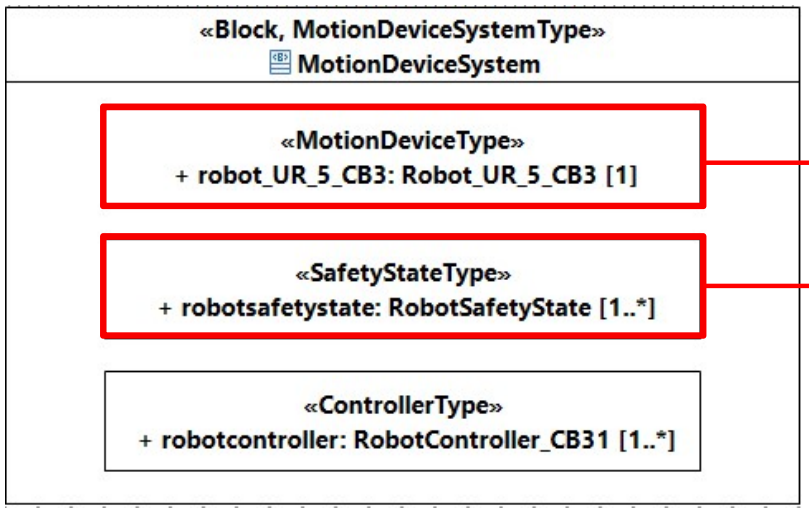
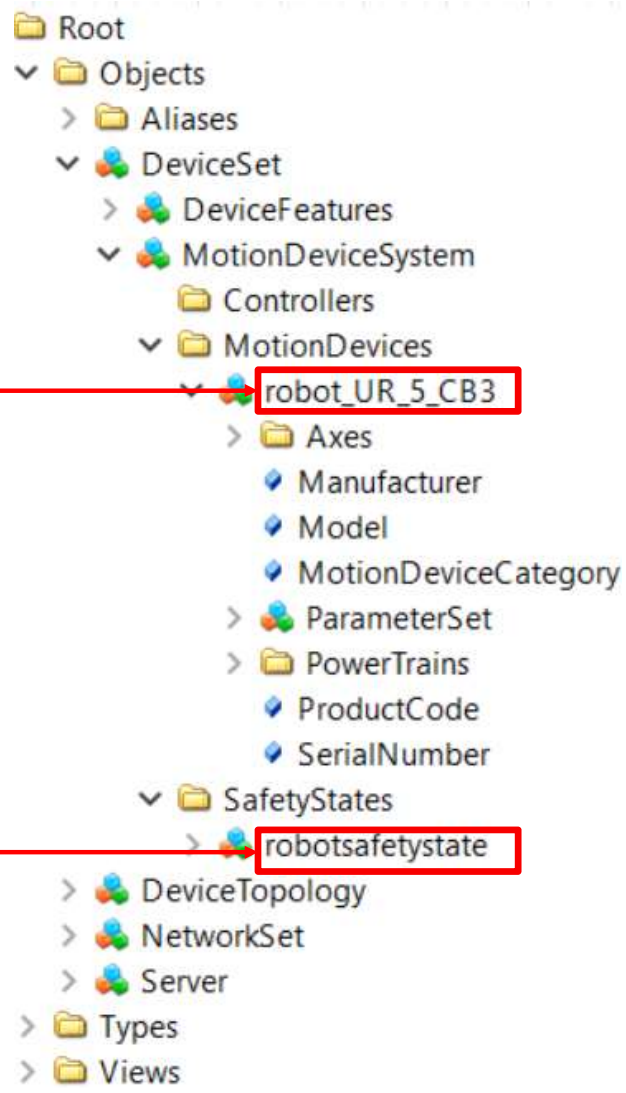
Transformation of Blocks

UA Expert

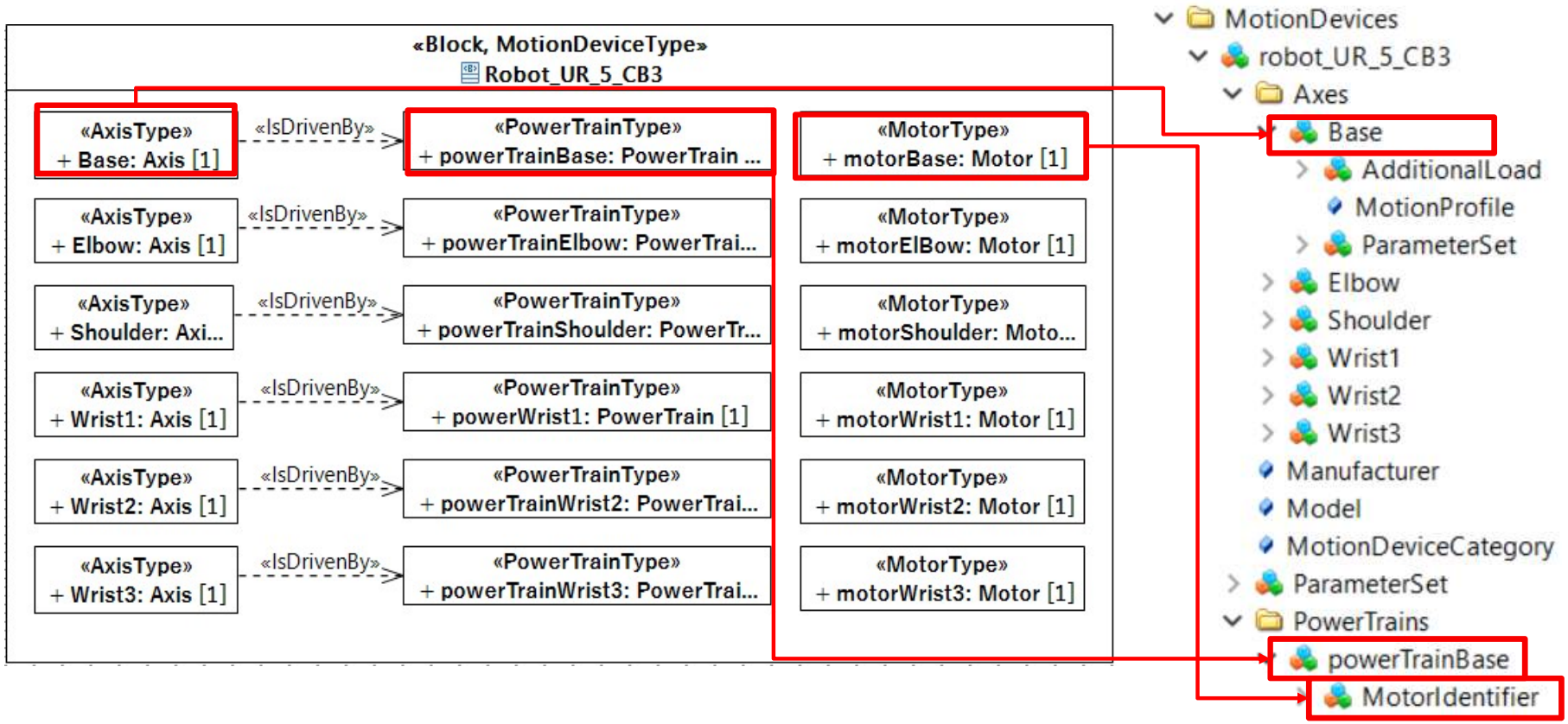


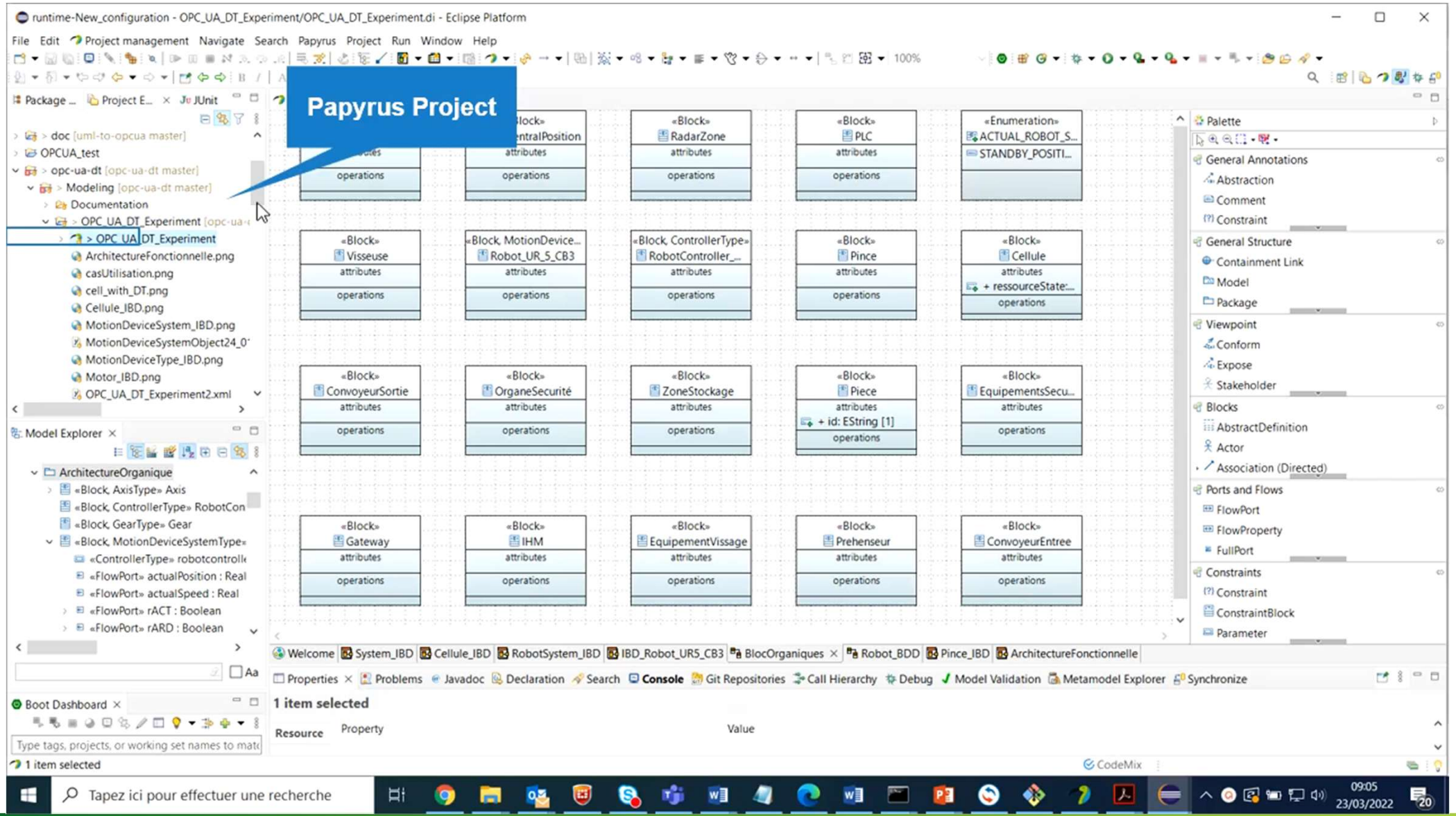
Transformation of MotionDeviceSystemType instance





Modelling and Transformation of the MotionDeviceType instance

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Modeling [opc-ua-dt master]
Documentation
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Containment Link
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Package
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Conform
Expose
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Actor
Association (Directed)
Ports and Flows
FlowPort
FlowProperty
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ConstraintBlock
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Resource Property Value
CodeMix
Tapez ici pour effectuer une recherche
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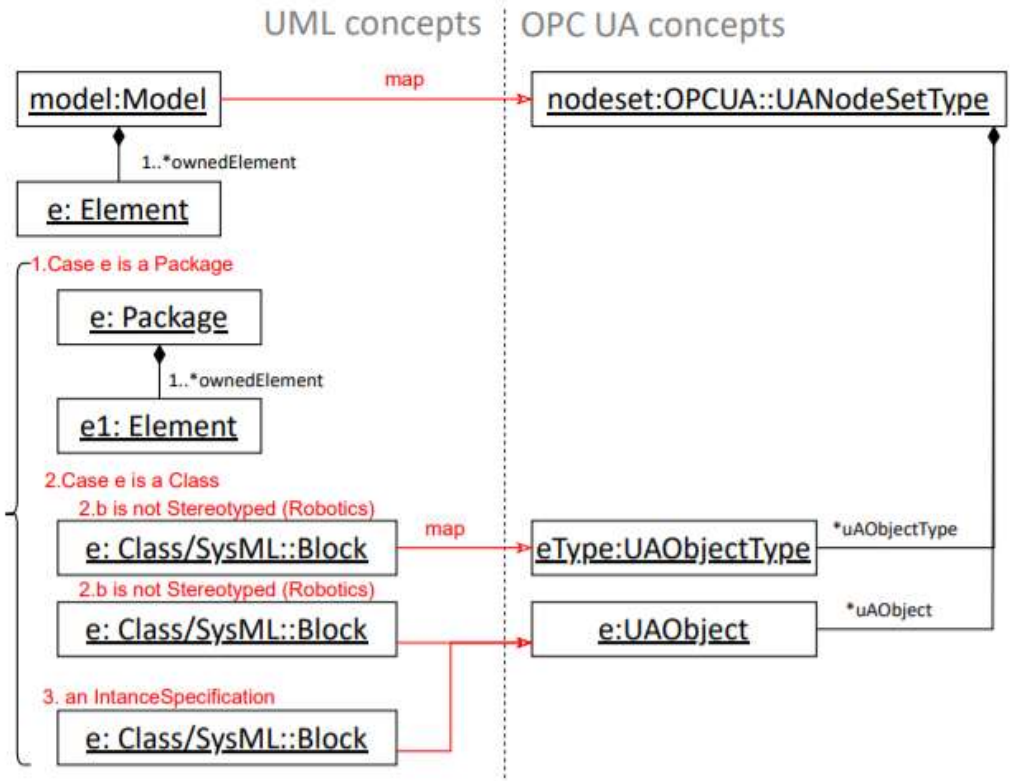
23/03/2022

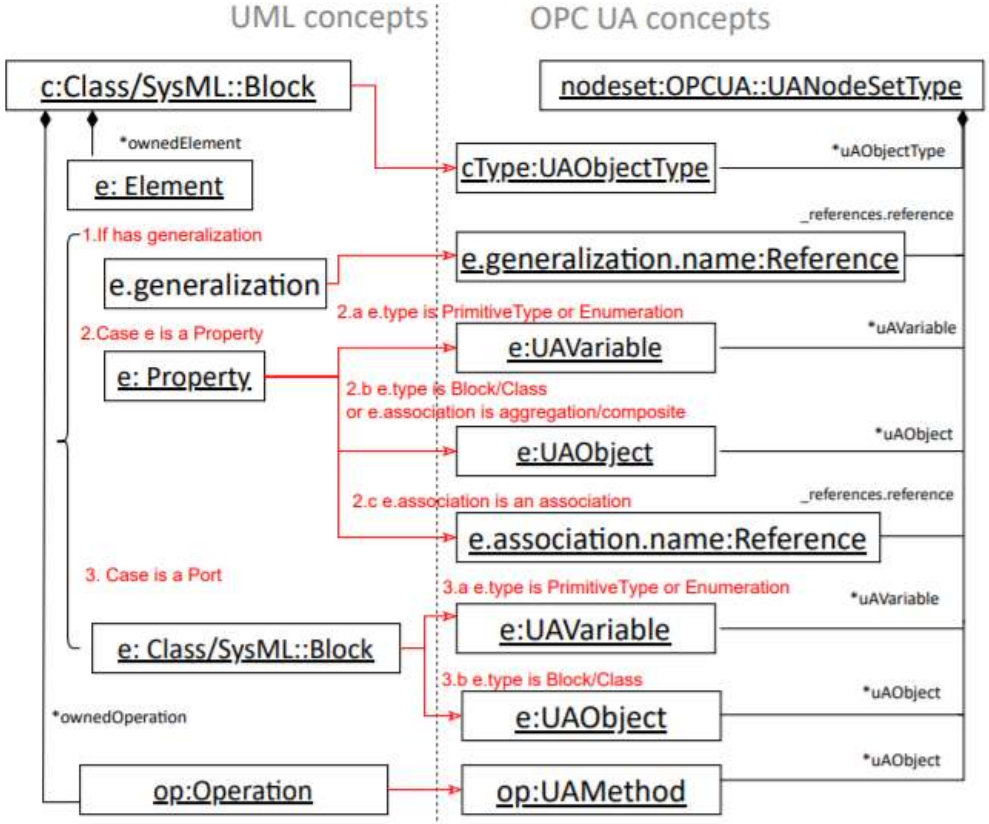
Future Work

- Take into consideration other Companion Specification (PLC, End Of Arms Tools…)
- Generation of Companion Specification from SysML Models
- Automatically deploy the OPC-UA clients (3D DT) from the SysML model

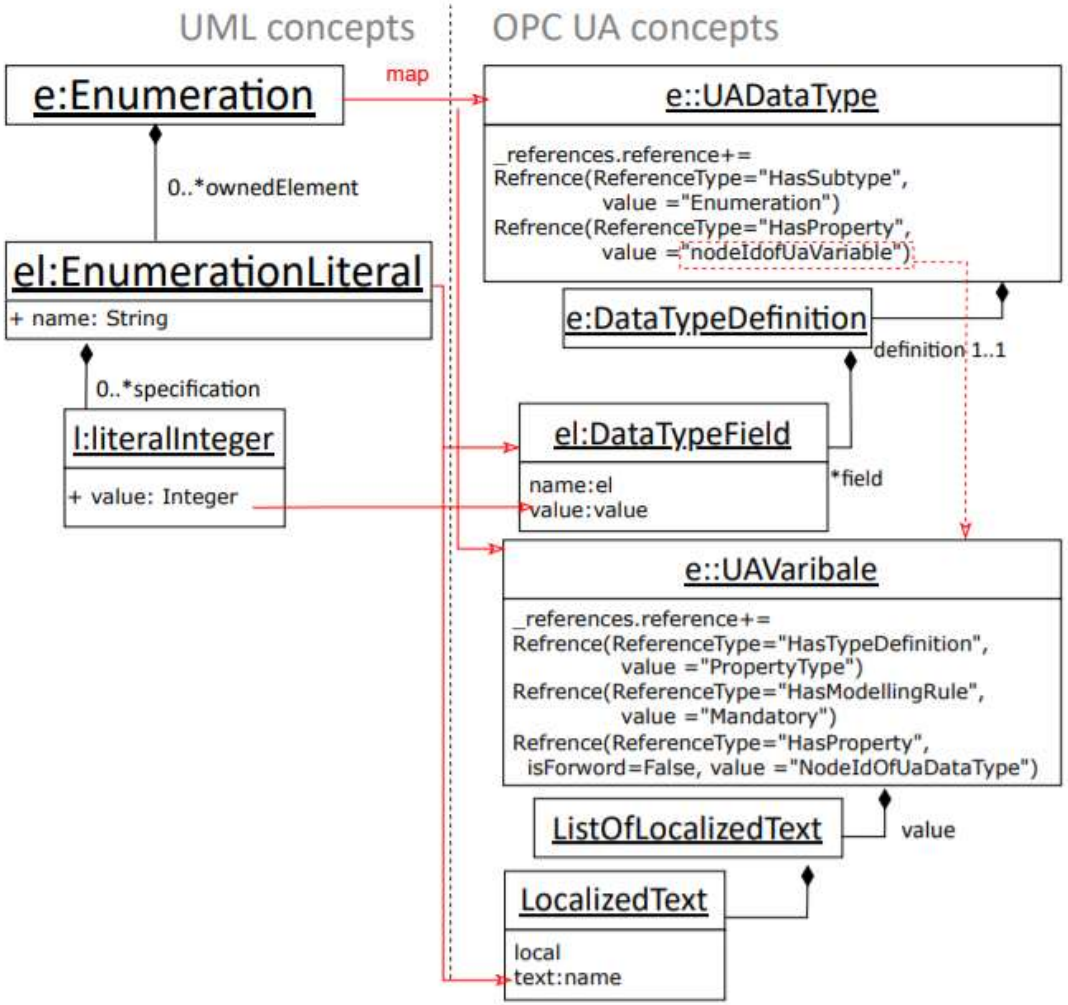
Questions

Transformation rules 1

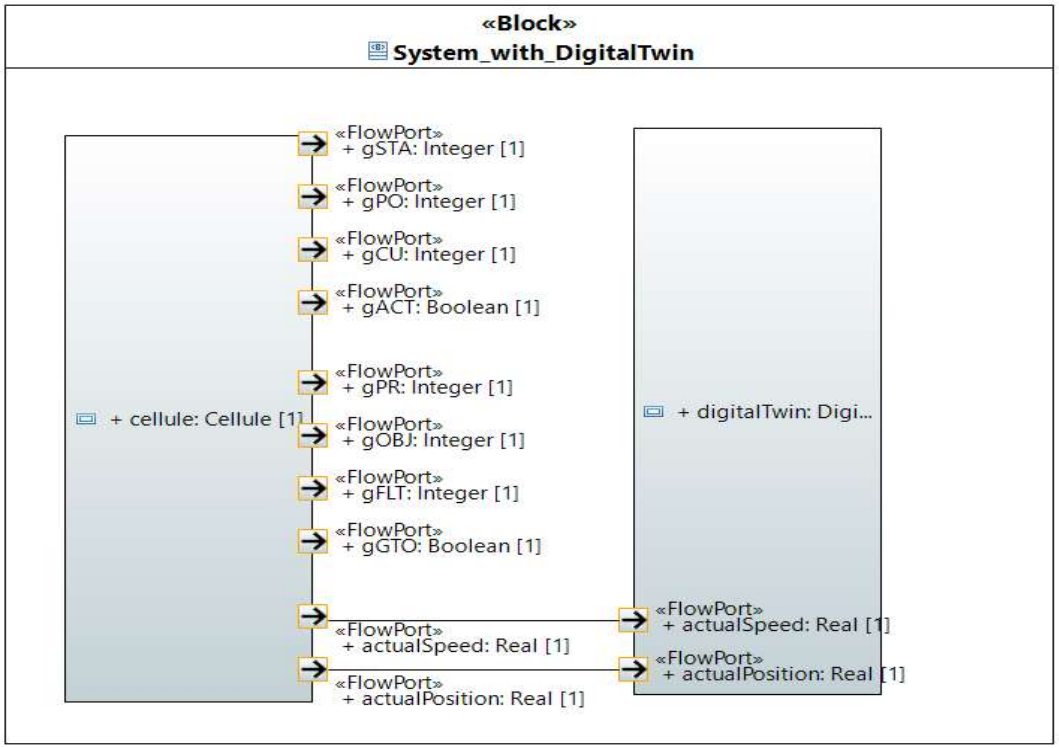




Transformation rules 2



Cell Model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