



fortiss

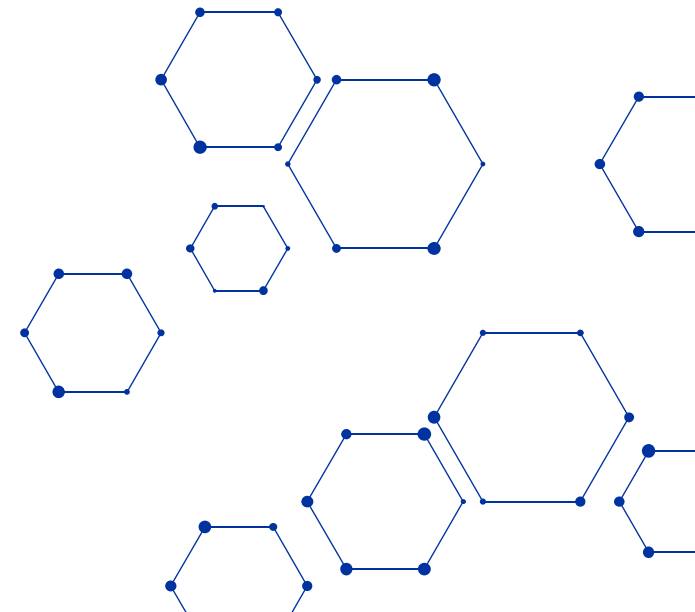
München, 2016-09-06

IEC 61499 – ROS

Controlling robots with IEC 61499 using 4DIAC

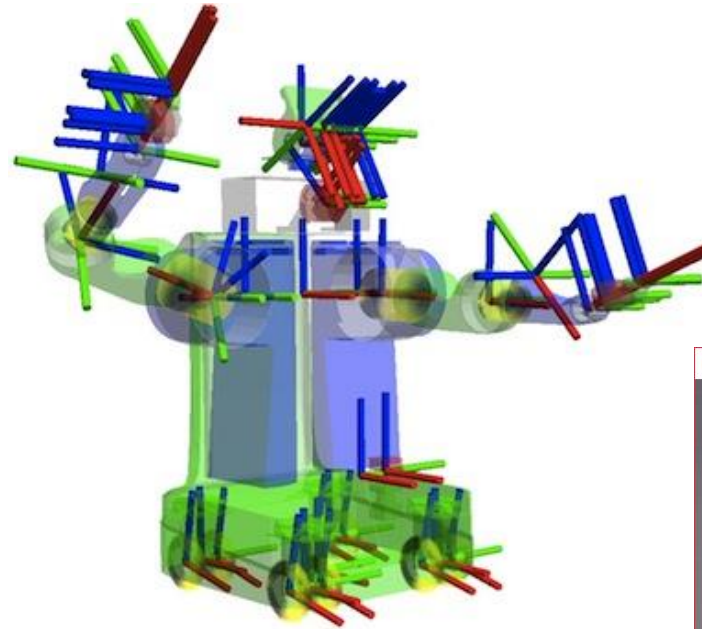
Waldemar Eisenmenger

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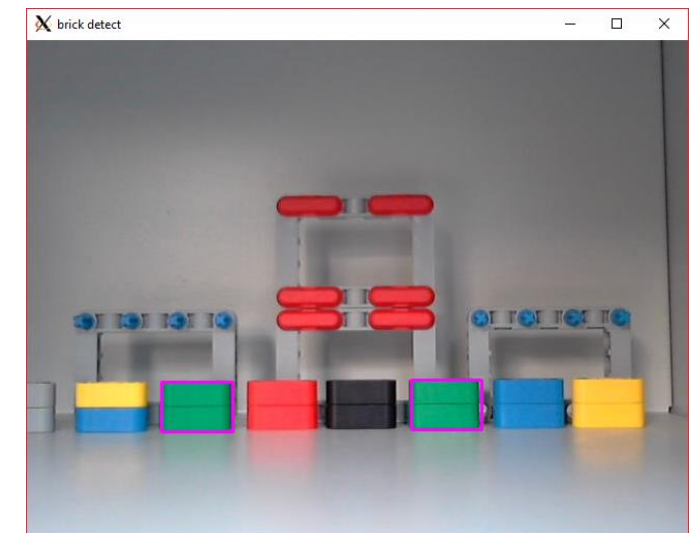
ROS – Short Introduction

- Middleware for controlling robots
 - Provide communication infrastructure
- Provide libraries for:
 - Robot Description Language
 - Pose Estimation
 - Diagnostics
 - Localisation and Navigation
 - Standard Message Definitions
- Support integration of third party libraries:
 - OpenCV
 - Gazebo
 - MoveIt



 ROS

<https://www.ros.org>



ReApp

Reusable Robot Applications for Flexible Robot Systems Based on ROS

- ReApp provides a model-based, cloud-enabled
 - Software development toolchain,
 - ReApp store and
 - Execution/simulation platform
- ReApp supports
 - Component Vendor modelling HW-Access-Component
 - Software developer modelling SW-Components and Skills
 - System integrator apply Skills to Solutions
- Special requirements
 - Real-time behavior
 - Model based Coordinators



AUTONOMIK
FÜR INDUSTRIE 4.0

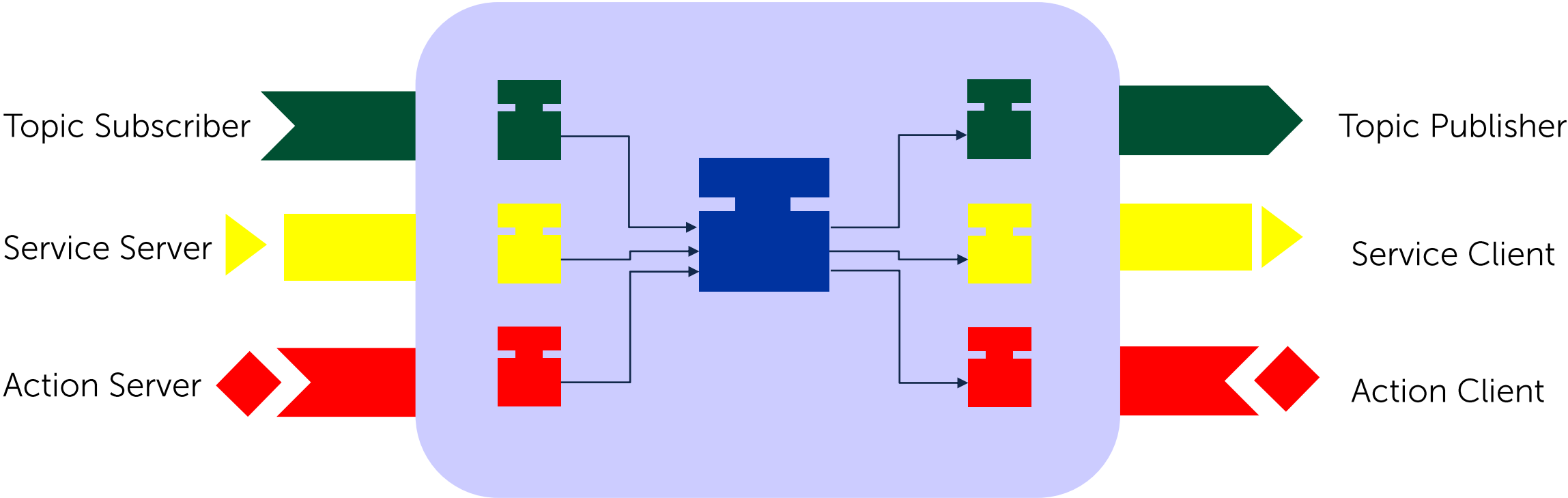
Supported by:



on the basis of a decision
by the German Bundestag

ReApp Coordinator Node

IEC 61499 Network



ROS Topics

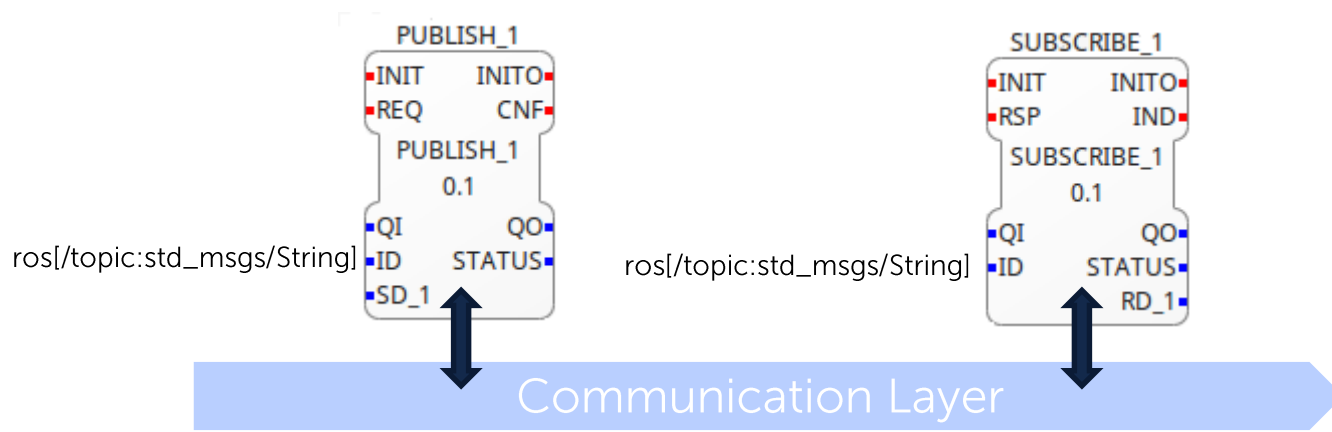
Communication Patterns

- Unidirectional transaction model
- Types defined by `msg` files



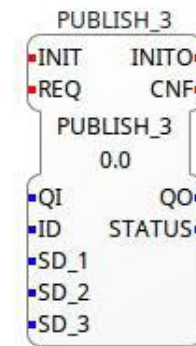
ROS Topics

Communication Patterns



ROS	IEC61499
std_msgs/Empty	-
std_msgs/Float64	LREAL
std_msgs/Bool	BOOL
std_msgs/Int32	DINT
std_msgs/String	STRING

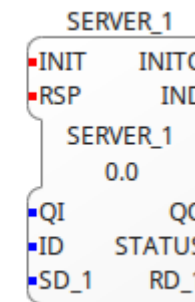
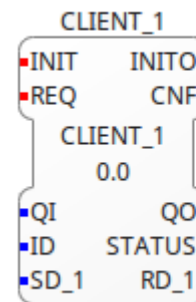
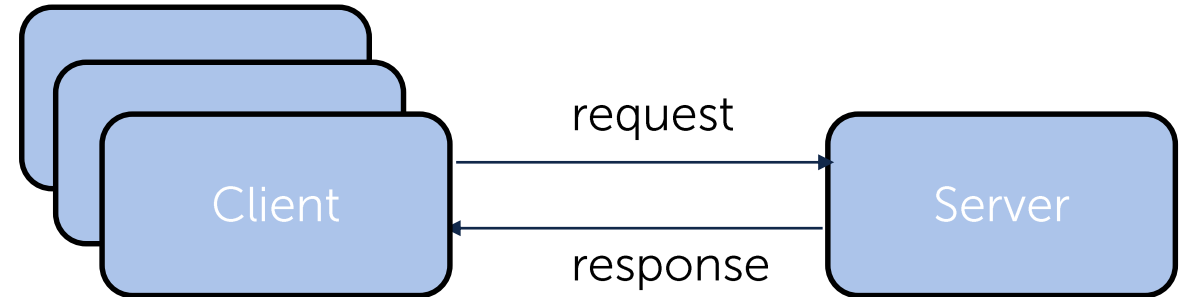
geometry_msgs/Vector3 = { std_msgs/float64
std_msgs/float64
std_msgs/float64



ROS Services

Communication Patterns

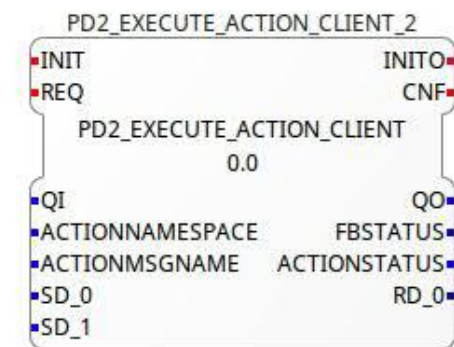
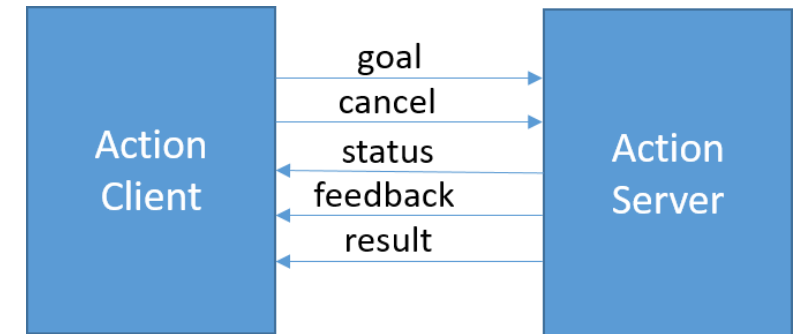
- Bidirectional communication
- Types defined by `rossrv` files
- IEC 61499 provides client server FB



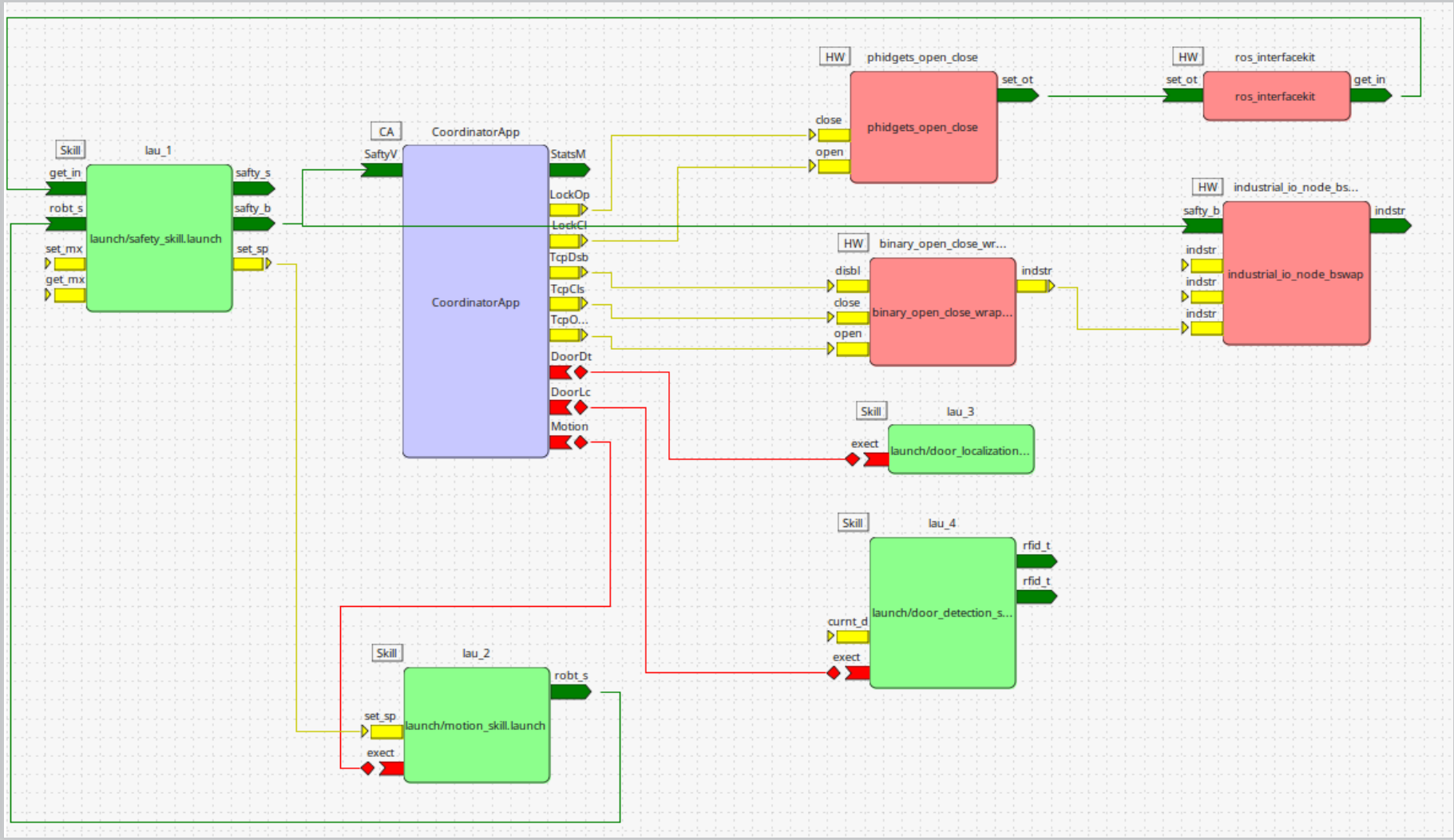
ROS Actions

Communication Patterns

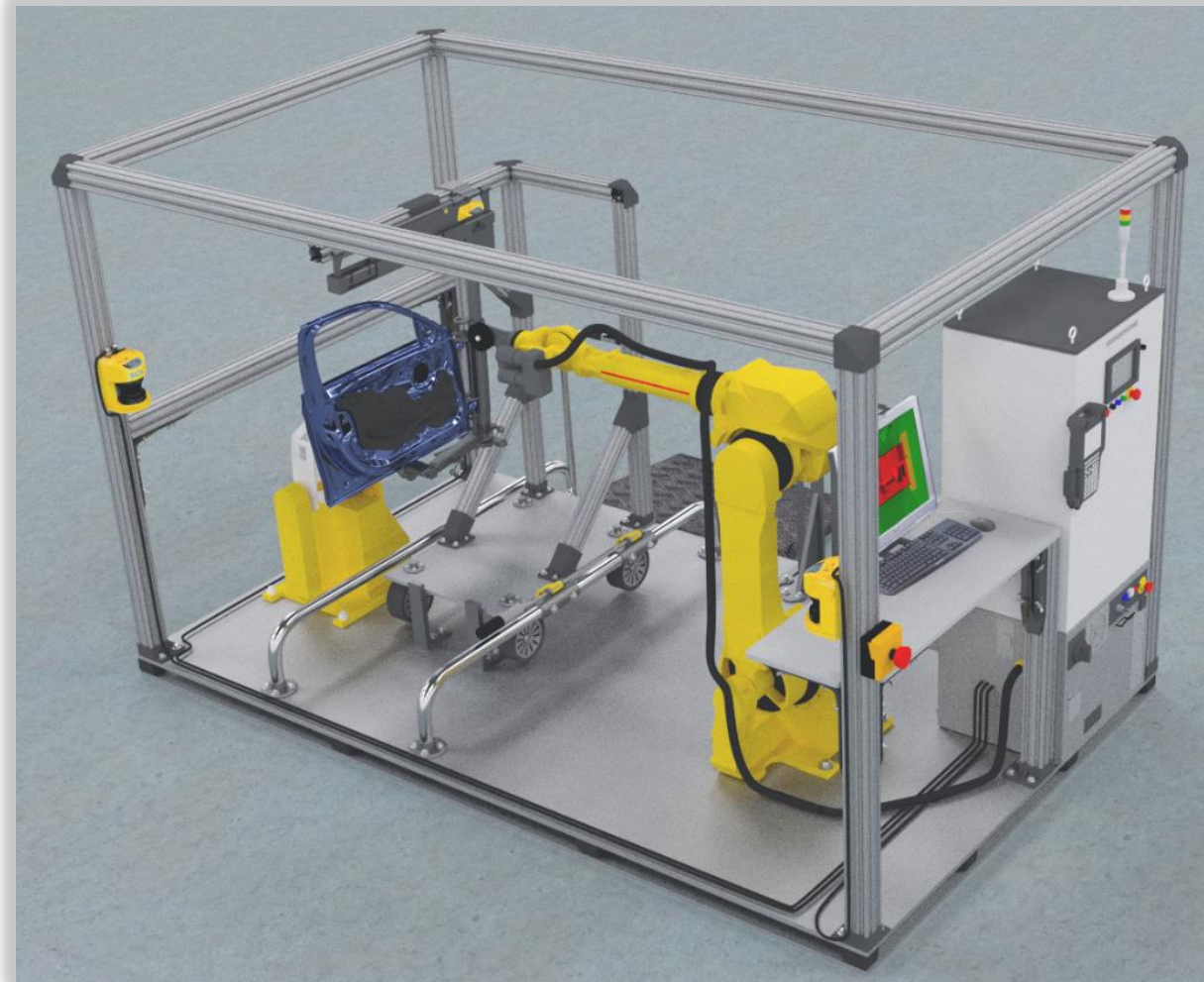
- ROS specific communication for tasks with long processing time
- Composition of five topics
- `action` files define goal, feedback and result types
- IEC 61499 does not provide native communication FBs for actions
- Service Interface FB for each action type



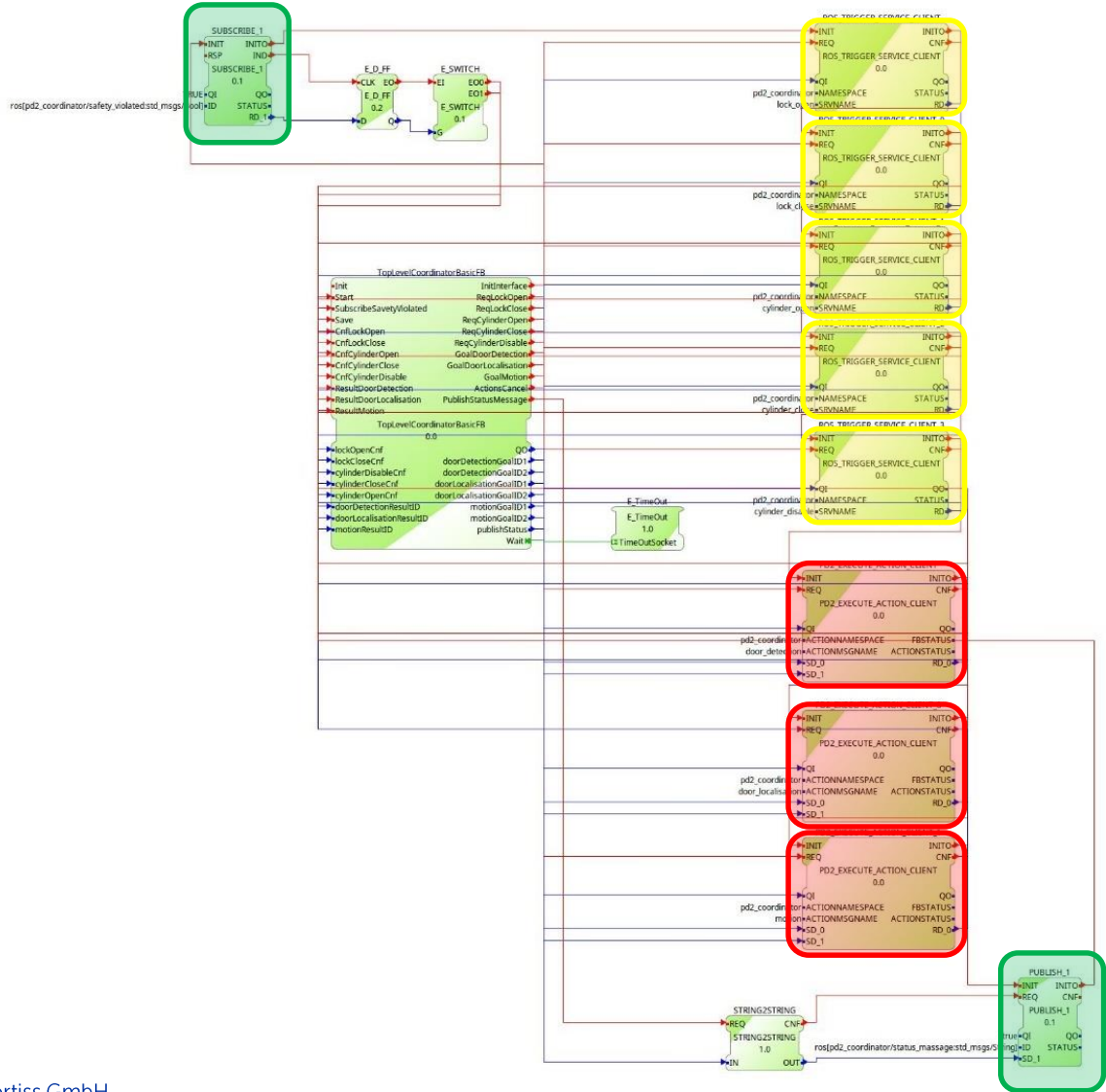
ReApp Pilot Demonstrator 2



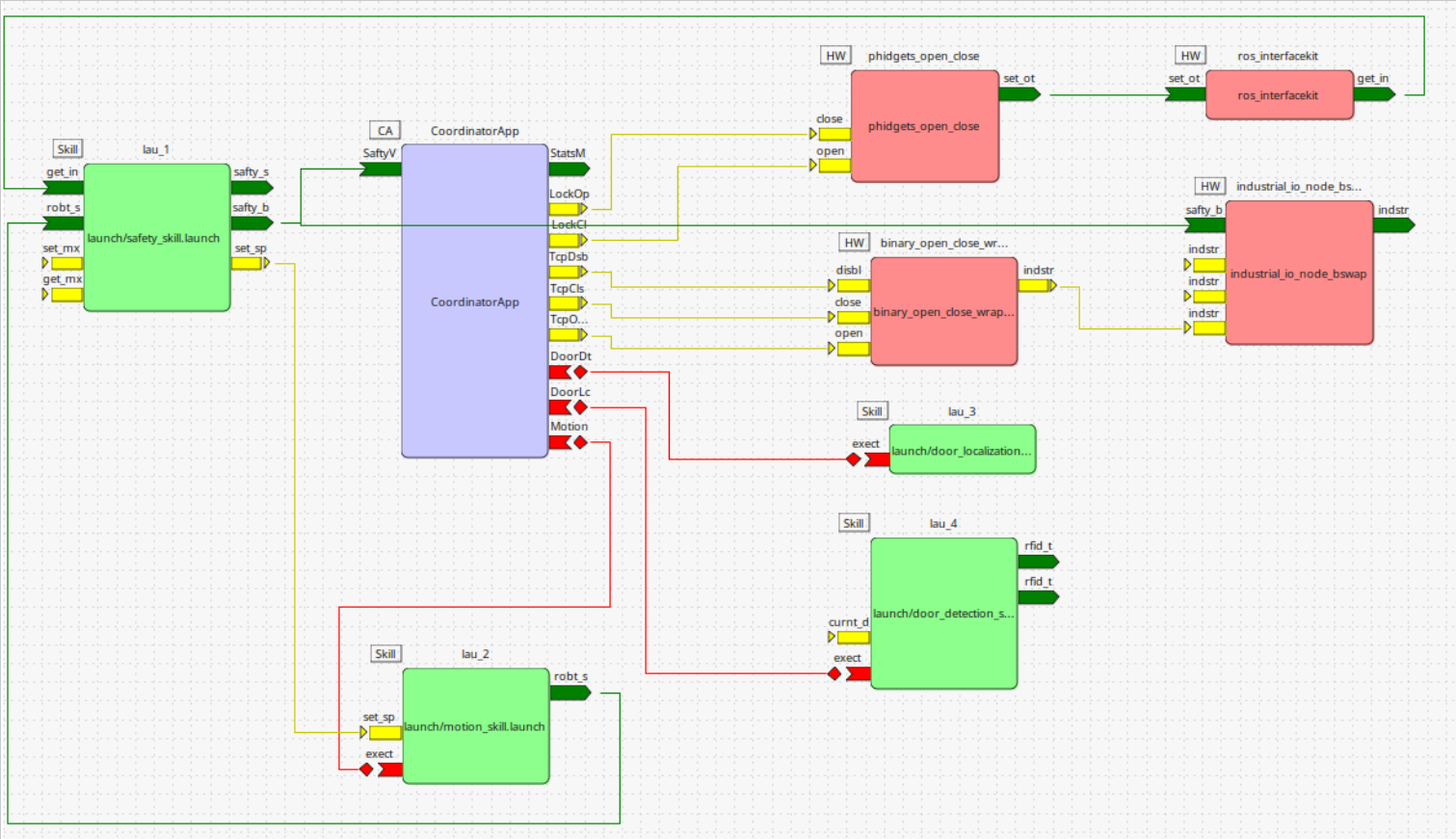
ReApp Pilot Demonstrator 2



ReApp Pilot Demonstrator 2



ReApp Pilot Demonstrator 2



Summary

- IDE:
 - Generate IEC 61499 model from ReApp model
 - Integrated ECC in ReApp
- FORTE:
 - Extended FORTE communication layer for publisher/subscriber FB
 - Implemented SIFB for ROS service communication
 - Implemented SIFB for ROS action communication
- Next Steps:
 - Complete communication layer for client/server FB
 - Create Generic Action communication FB

Thank you for your attention!

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