

*Tutorial “Model-Driven Software Engineering in Robotics:
Models, Tools, Systems, Solutions, Challenges”*

Interactive Tool Demo: Stepwise Migration to Model-Driven Development



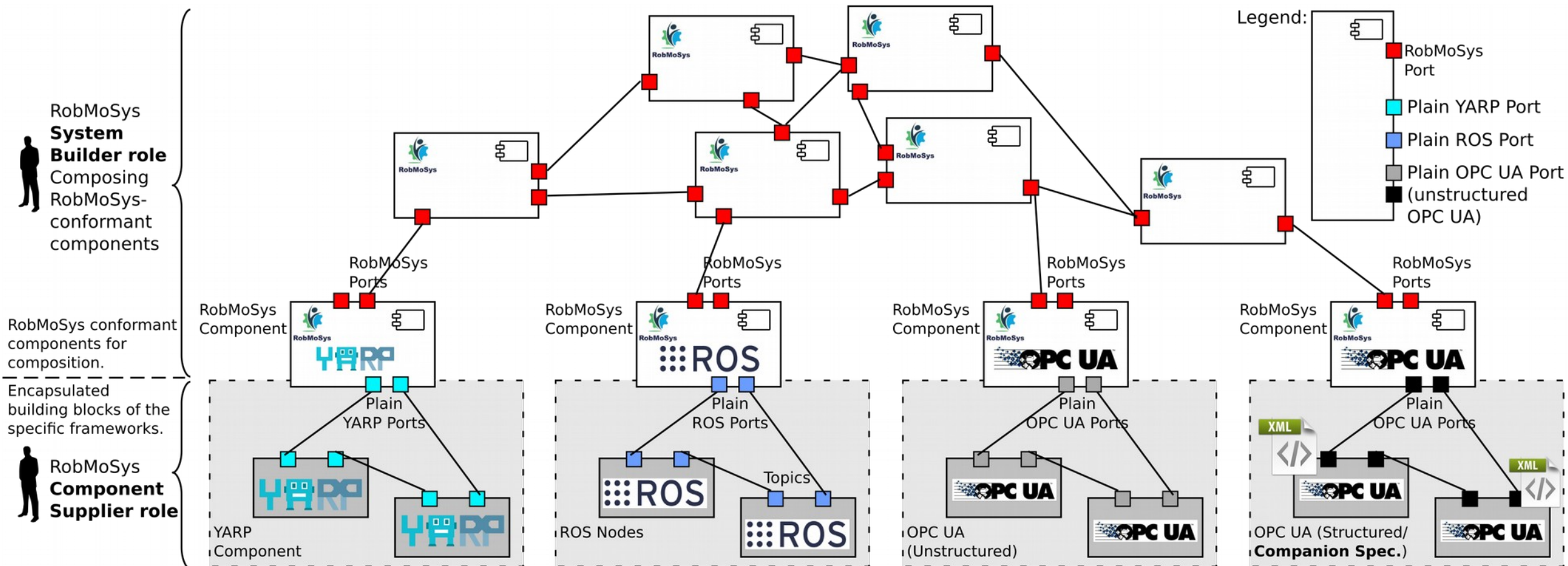
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 732410.



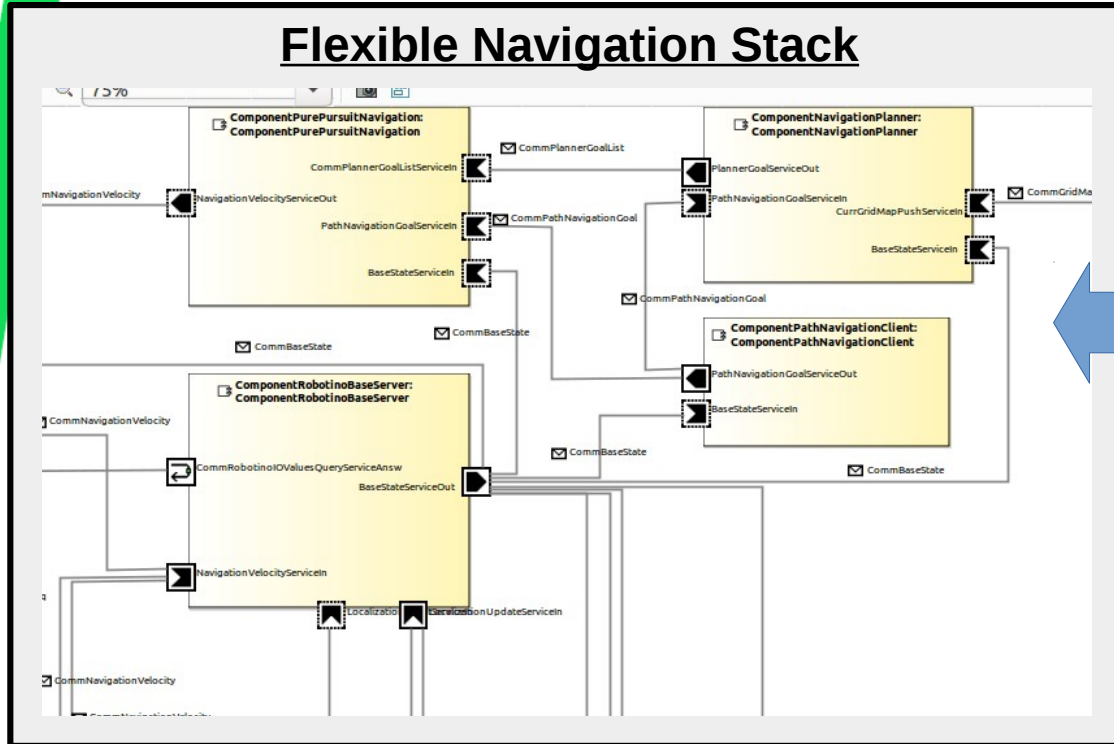
Outline

- Part I: Mixed Port Components
- Part II: Middleware Agnostic Modeling

Mixed-Port Components



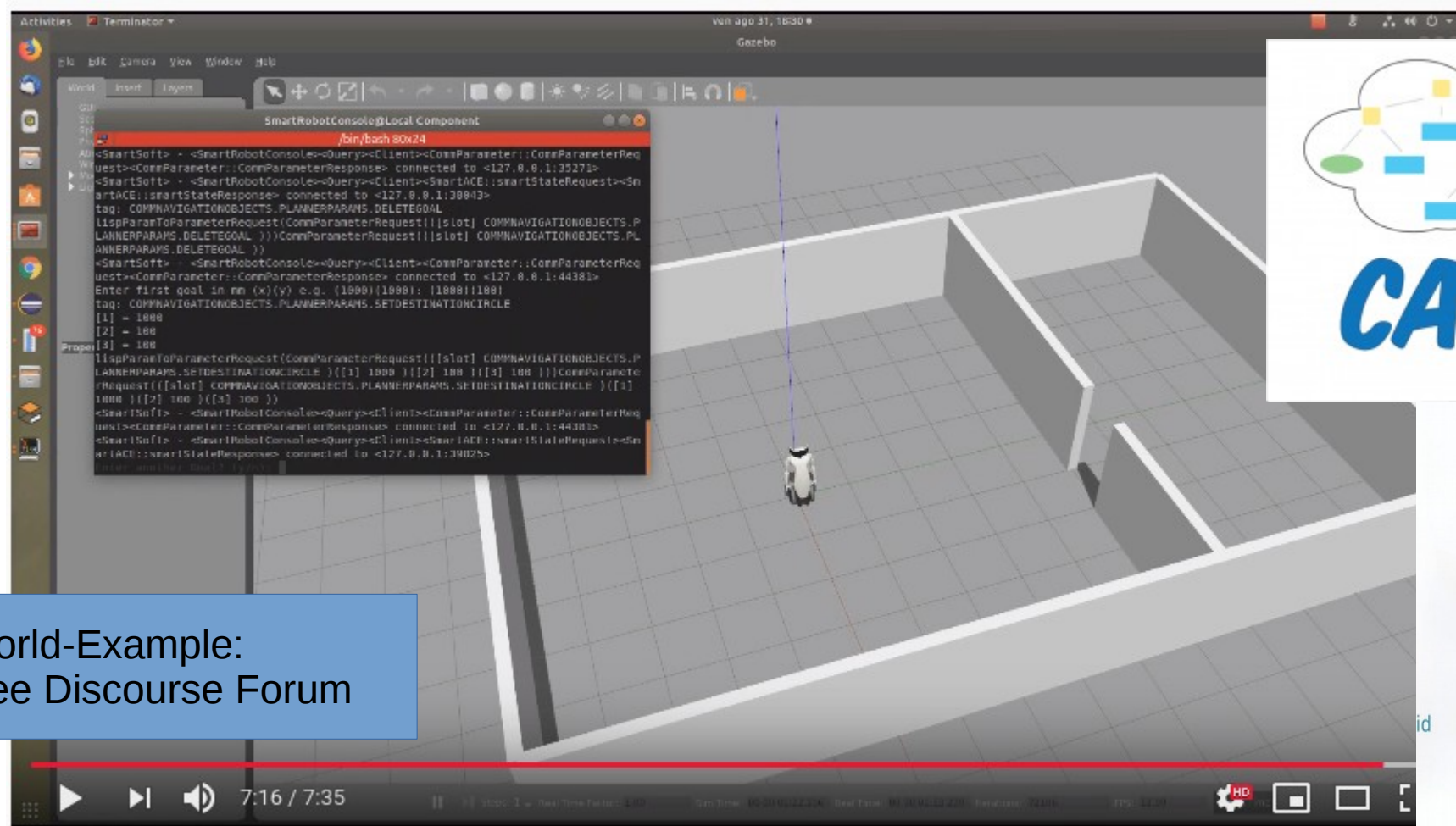
Replacement of Components: **Flexible Navigation Stack**



Mixed-Port Components



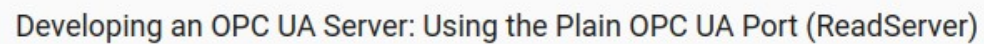
RobMoSys



Real-World-Example:
by CARVE, see Discourse Forum

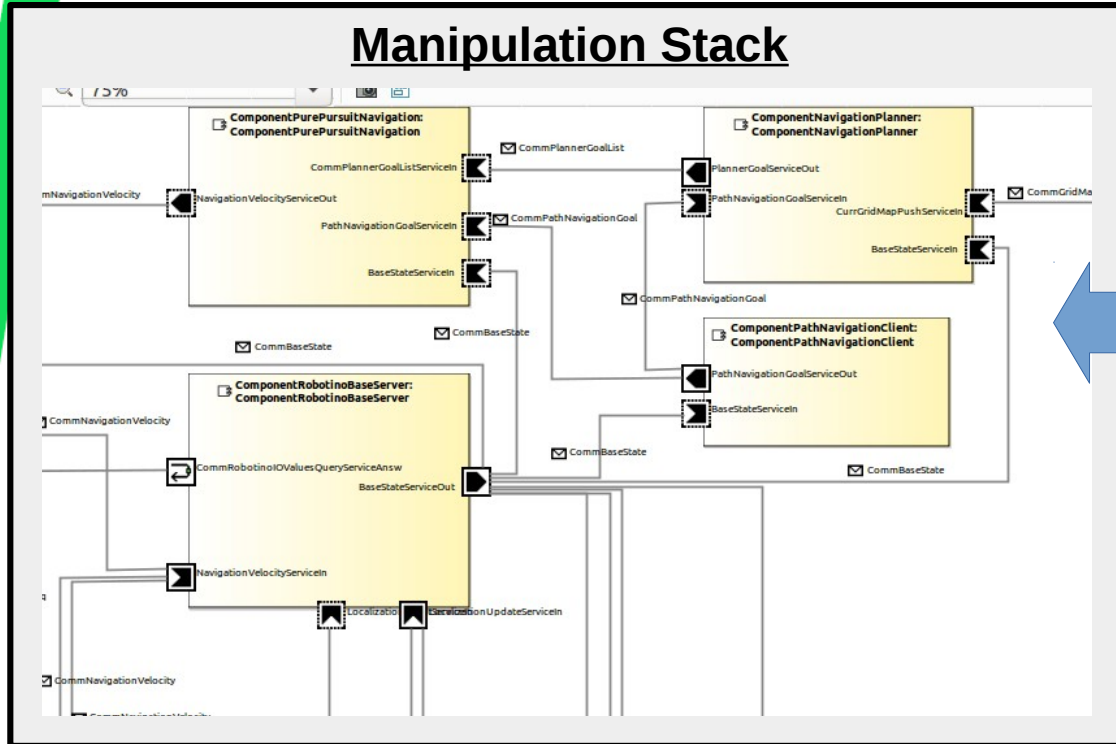
Using the YARP Framework and the R1 robot with RobMoSys (CARVE ITP)

<https://www.youtube.com/watch?v=p466dW-IU4w&t=51s>



0 1 SHARE SAVE ...

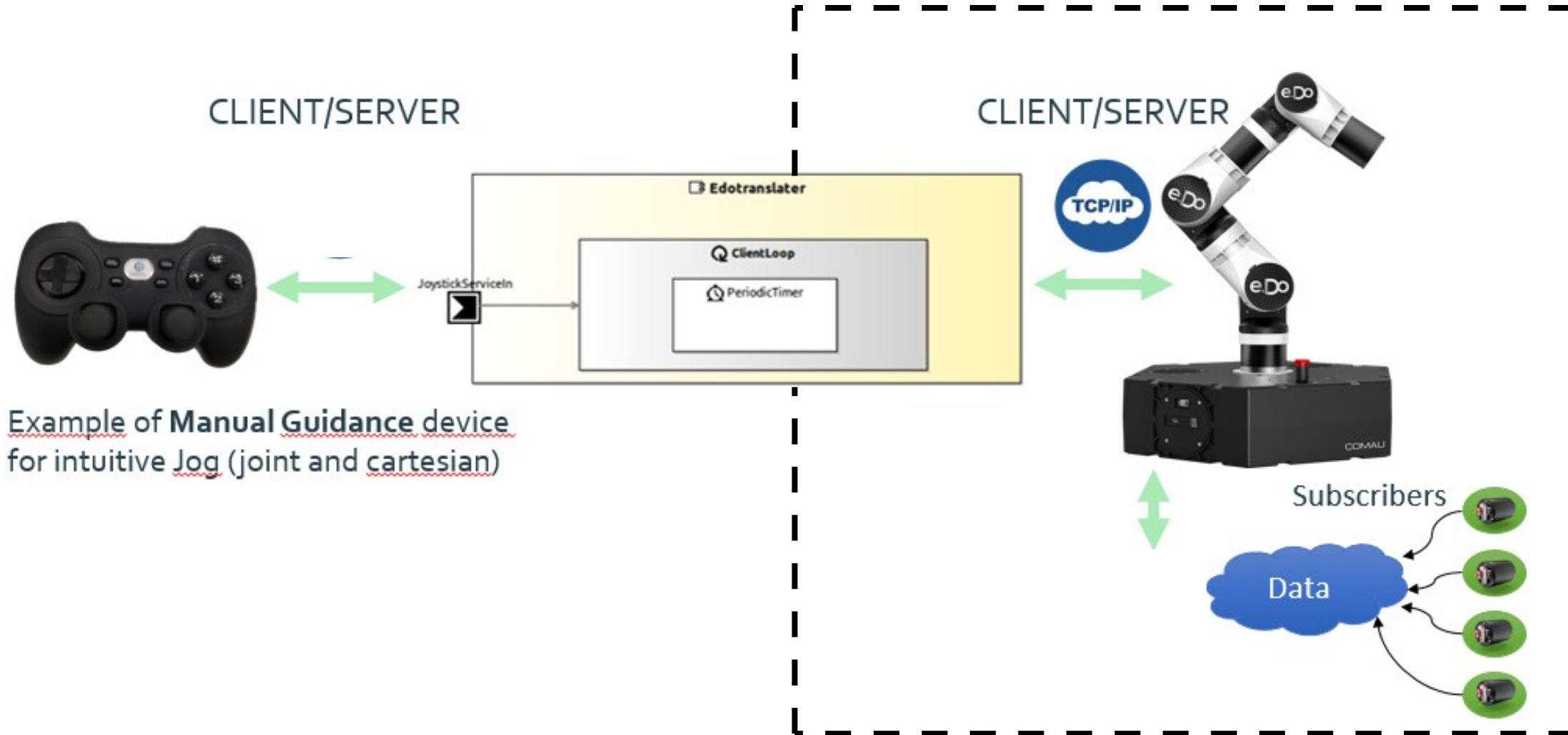
Replacement of Components: Manipulation



Replacement of Components: Manipulation with e.DO



RobMoSys

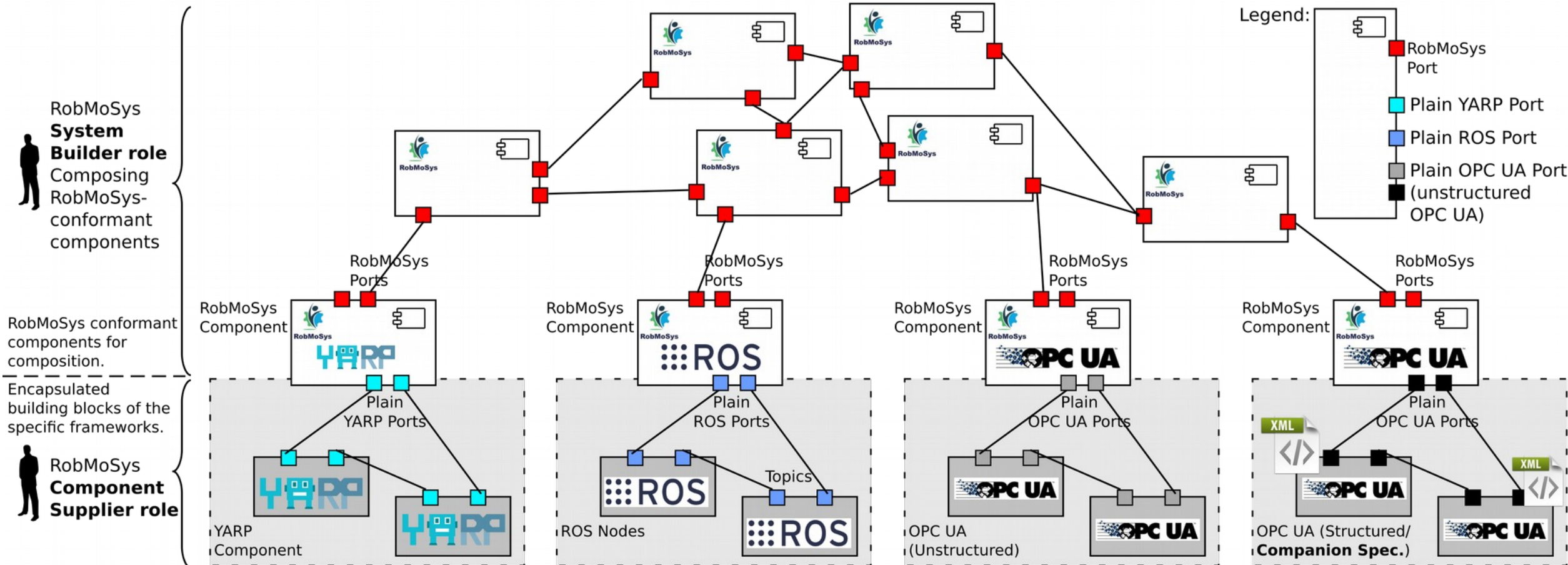




Mixed-Port Components



RobMoSys



Demo:

Mixed-Port Components – Accessing ROS nodes

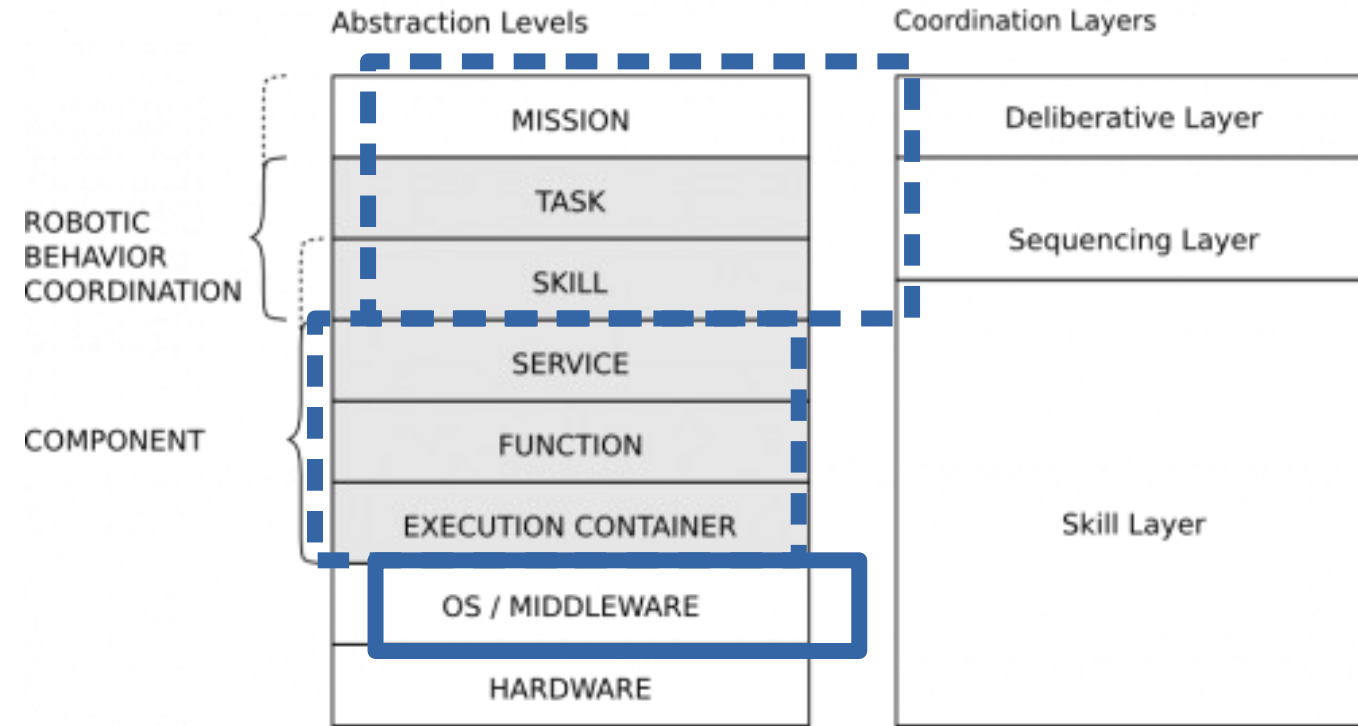
Example: ROS Joystick

Tutorial and screencast to reproduce at home:
<https://wiki.servicerobotik-ulm.de/tutorials:ros:mixed-port-component-ros>

Outline

- Part I: Mixed Port Components
- **Part II: Middleware Agnostic Modeling**

RobMoSys User-Story: Middleware Late Binding / Middleware agnostic modeling



Model Explorer

type filter text

- > CommBasicObjects [DomainModelsRepo]
- > CommLocalizationObjects [DomainModels]
- > CommNavigationObjects [DomainModelsR]
- > CommRobotinoObjects [DomainModelsRep]
- > CommTrackingObjects [DomainModelsRep]
- ComponentJoystickServer
- > ComponentLaserObstacleAvoid [Compon
- > ComponentPlayerStageSimulator [Compo
- > SmartAmcl [ComponentRepository featur
- > SmartCdlServer [ComponentRepository fe
- > SmartGazeboBaseServer [ComponentRep
- > SmartGMapping [ComponentRepository f
- > SmartJoystickNavigation [ComponentRep
- > SmartJoystickServer [ComponentRepositi

ComponentJoystickServer

SystemOpcUaJoystickTestComponentArchitecture

100%

Palette

System Tools

- ImportComponents
- ComponentInstance
- Connection
- RequiredService(s)
- ProvidedService(s)
- ParameterStructInstance

SeRoNet Tools

- Plain OPC UA DeviceClient Instance
- OPC UA SeRoNet Backend

Outline

Properties

Problems

System Parameter Editor

Component Parameter Edi

Error Log

Console

Search

System Component Architecture SystemOpcUaJoystickTest

Main

Semantic

Behaviors

Documentation

Properties

Name: SystemOpcUaJoystickTest

Activity Arch: <no value>

...

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Model Explorer

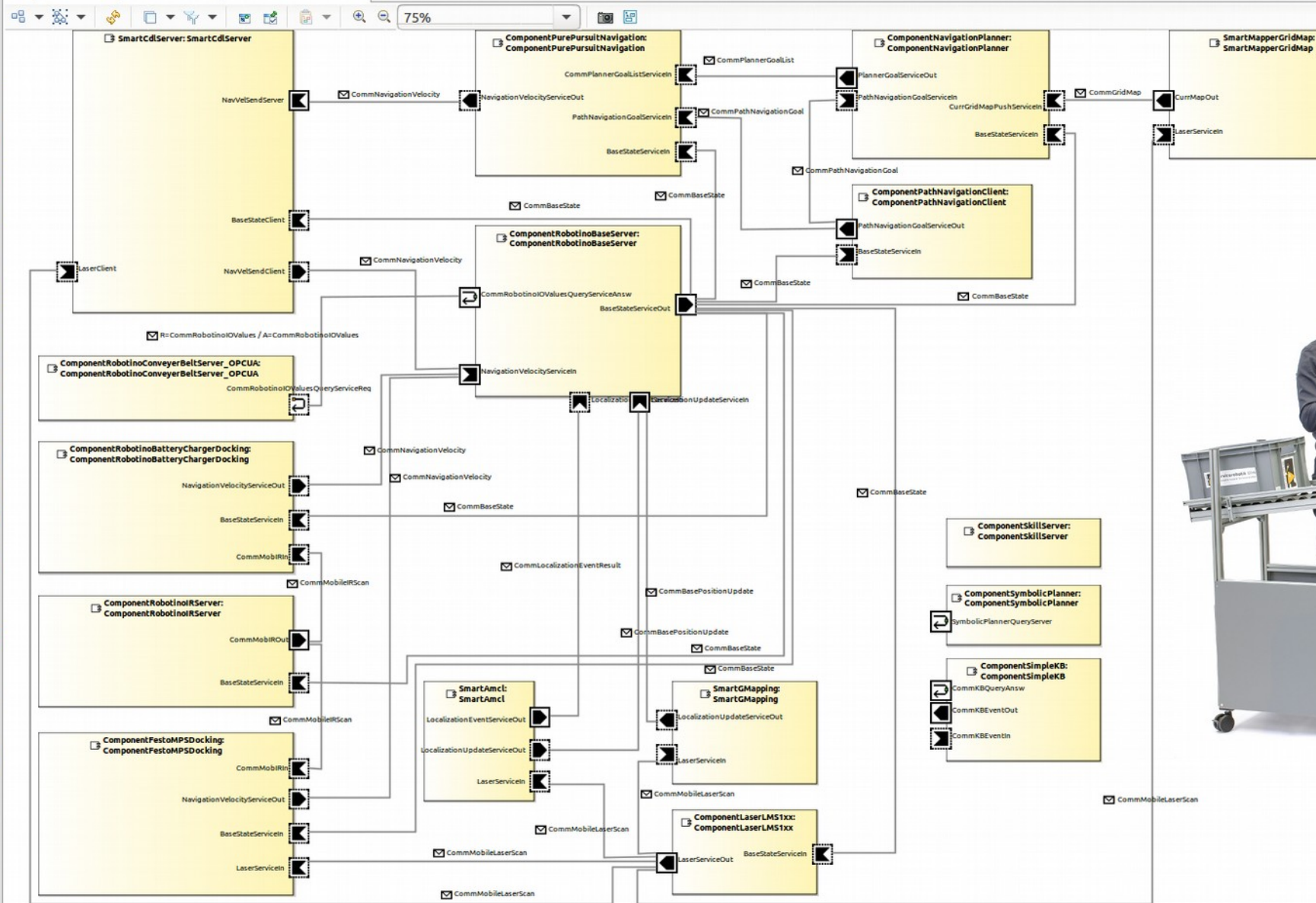
type filter text

- > ComponentSkillServer [ComponentRepository]
- > ComponentStateTest
- > ComponentSymbolicPlanner [ComponentRepository]
- > ComponentTTS [ComponentRepository]
- > ComponentTTSClient [ComponentRepository]
- > DomainPTU [DomainModelsRepository]
- > DomainSpeech [DomainModelsRepository]
- > DomainSymbolicPlanner [DomainModelsRepository]
- > DomainTestPiLongLong
- > SmartAmcl [ComponentRepository]
- > SmartCdlServer [ComponentRepository]
- > SmartGazeboBaseServer [ComponentRepository]
- > SmartGazeboManipulatorServer [ComponentRepository]
- > SmartGMapping [ComponentRepository]
- > SmartJoystickNavigation [ComponentRepository]
- > SmartJoystickServer [ComponentRepository]
- > SmartLaserLMS200Server [ComponentRepository]
- > SmartMapperGridMap [ComponentRepository]
- > SmartOpenRave [ComponentRepository]
- > SmartPioneerBaseServer [ComponentRepository]
- > SmartPlannerBreadthFirstSearch [ComponentRepository]
- > SmartRobotConsole [ComponentRepository]
- > SystemIntralogisticsPilot [20181123-20190101]
- > Project Dependencies
- > JRE System Library [java-8-openjdk-arm64]
- > model
- > Referenced Libraries
- > datasheet-gen
- > SystemIntralogisticsPilot.skills.json
- > smartsoft
- > representations.aird
- > SystemIntralogisticsPilotComponentArchitecture
- > SystemLaserObstacleAvoidP3dxPlaye
- > SystemLaserObstacleAvoidTiagoGaze
- > SystemP3dxNavigationPlayerStageSir

Outline



SystemIntralogisticsPilotComponentArchitecture



Palette

System Tools

- ImportCom...
- Component...
- Connection
- RequiredSer...
- ProvidedSer...
- ParameterS...



Demo:

Middleware agnostic modeling

Example: Navigation Stack