



SafeCC4Robot Safety Component Compositions for Robot

Munich, 23-10-2019

Jabier Martinez & Alejandra Ruiz



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



SafeCC₄Robot



1. *Use Case Scenario.*

- Approach
- Extension to Human Robot Interaction for Assembly use case

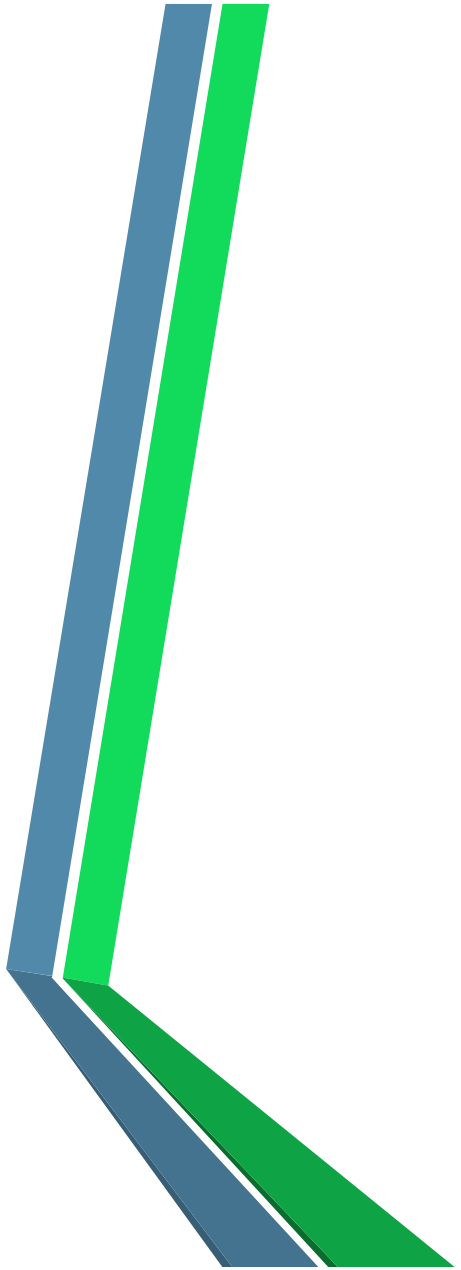
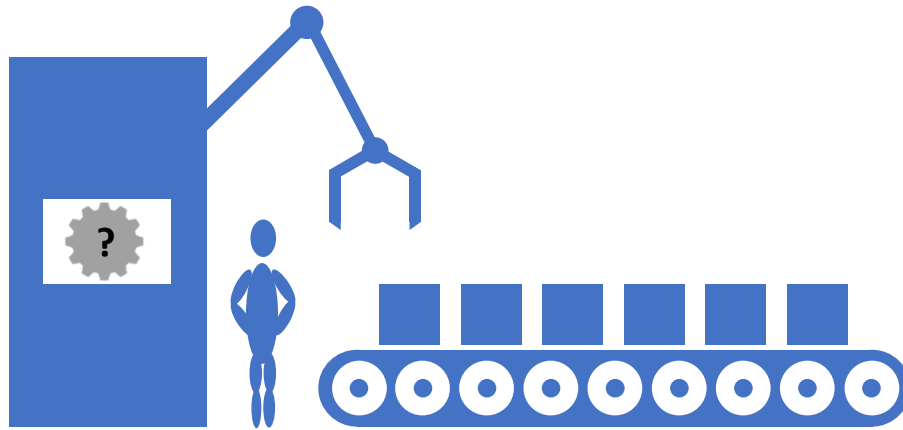
2. *Entry point to the RobMoSys meta-models.*

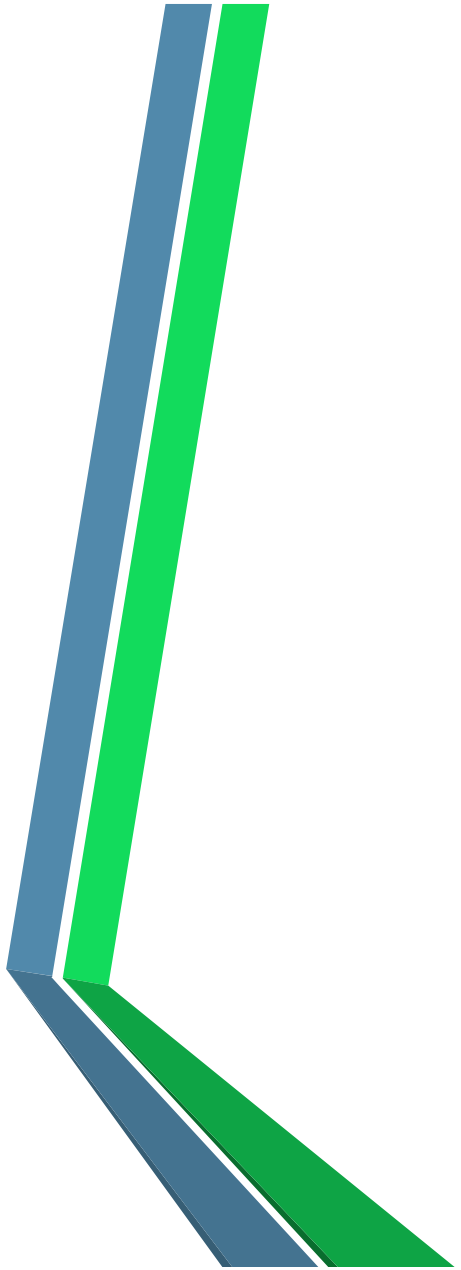
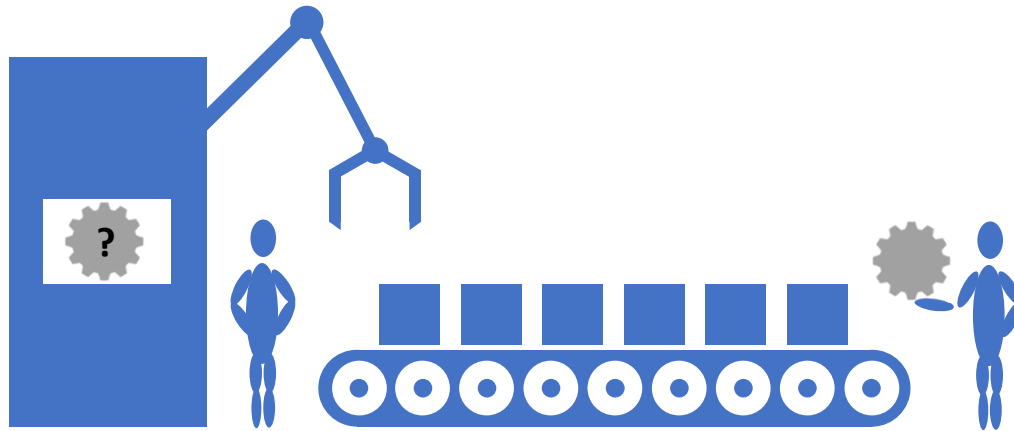
- Other projects inputs

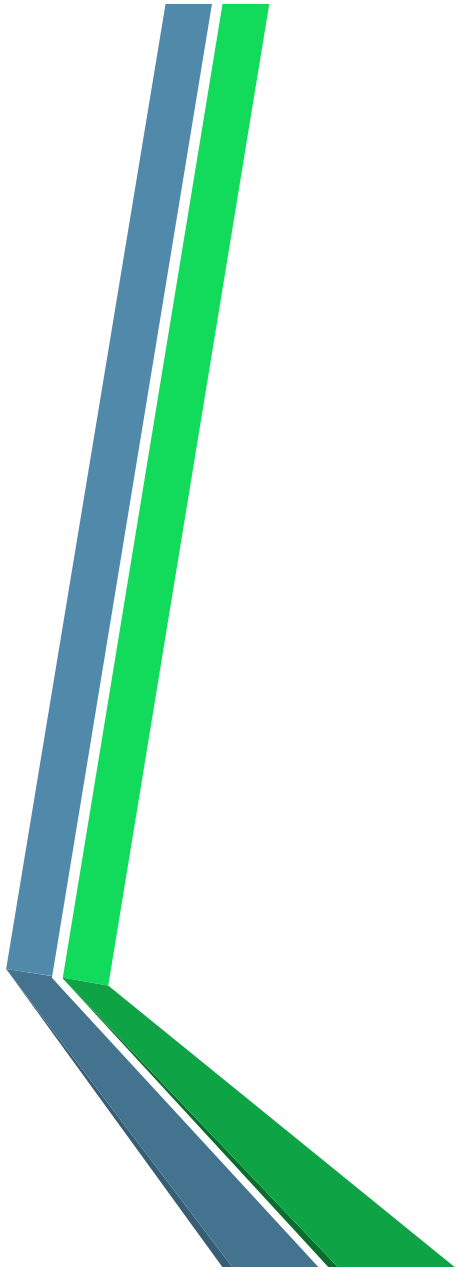
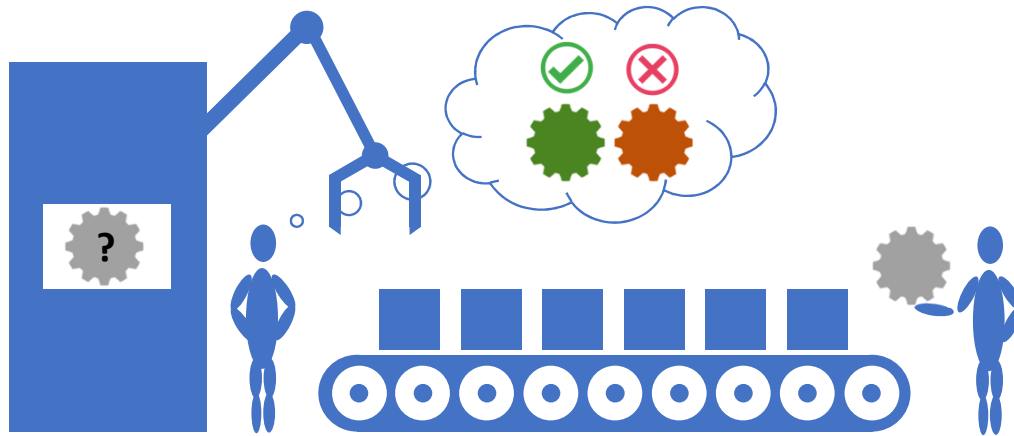
3. *Tooling.*

- OpenCert, Papyrus4Robots.

4. *Outcomes.*



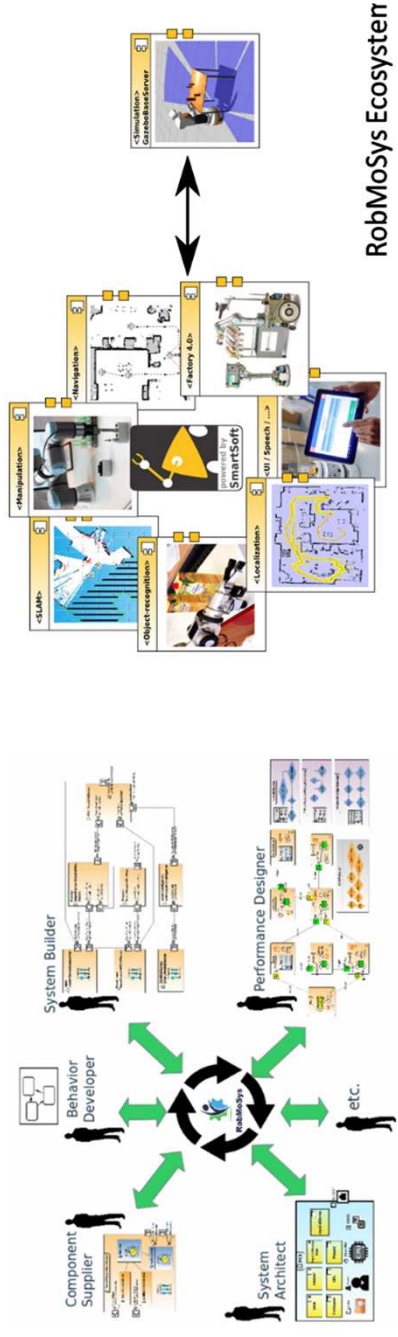




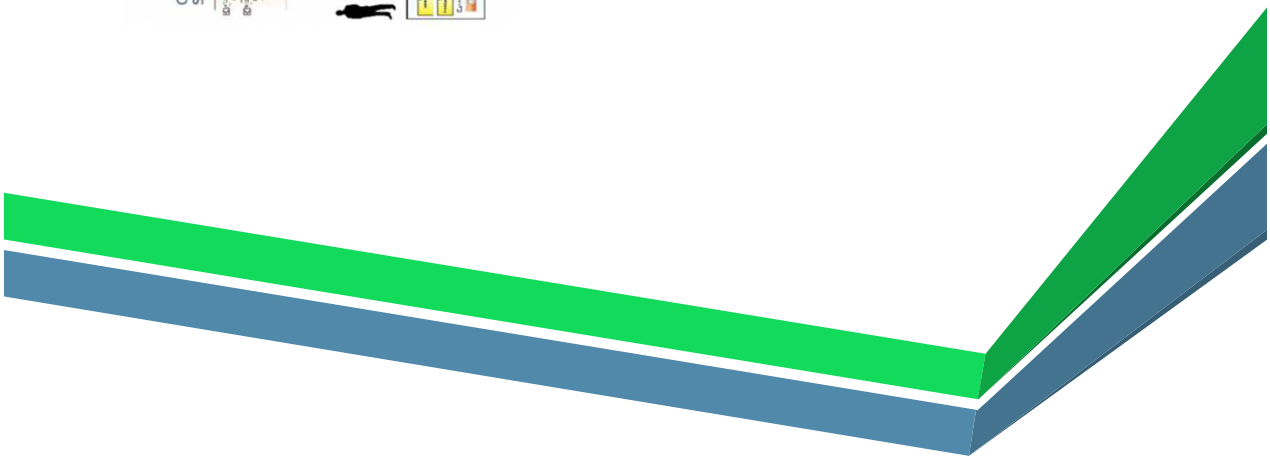
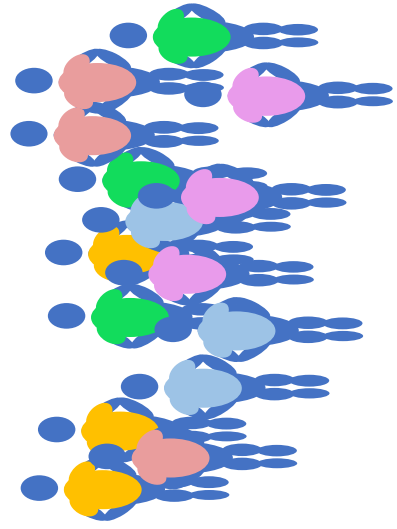
Human Robot Interaction for Assembly

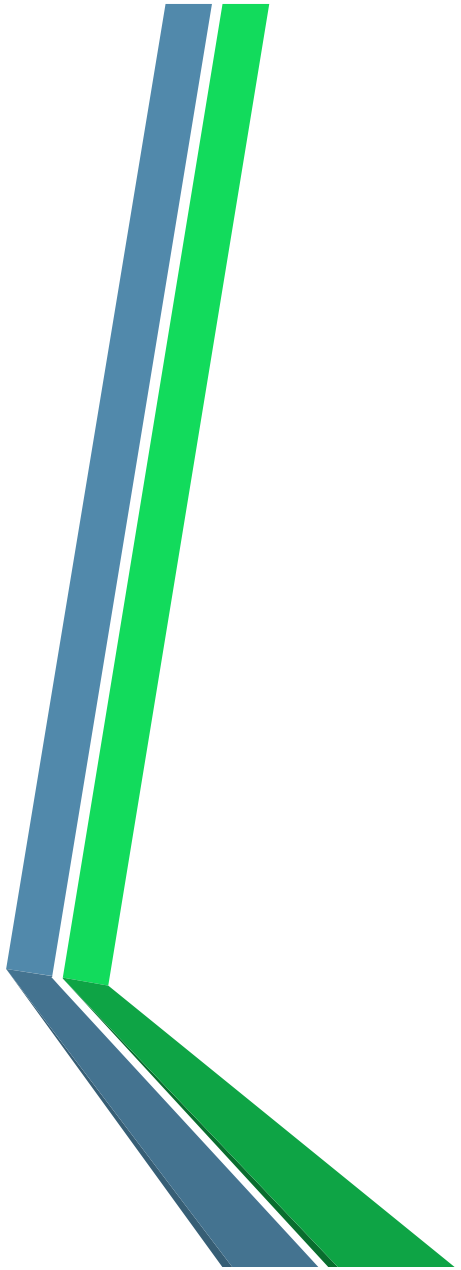
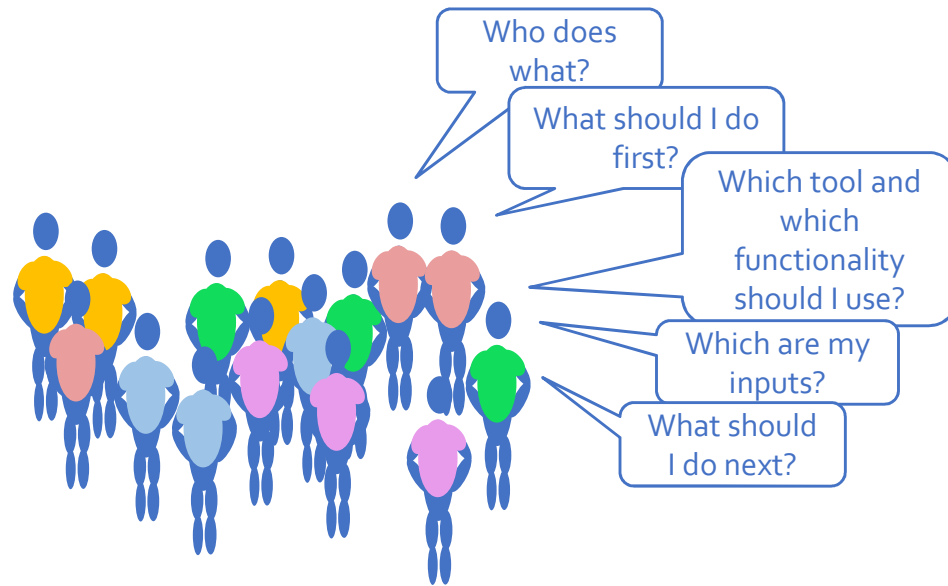
- Alice is the system builder for the development of a Human Robot Interaction for Assembly.
- Alice wants to reuse a component from an external provider (Bob)
- What information needs to provide Bob from the safety aspect?
- How can Alice validate the system behaviour will remain in a safe range once the component is integrated?

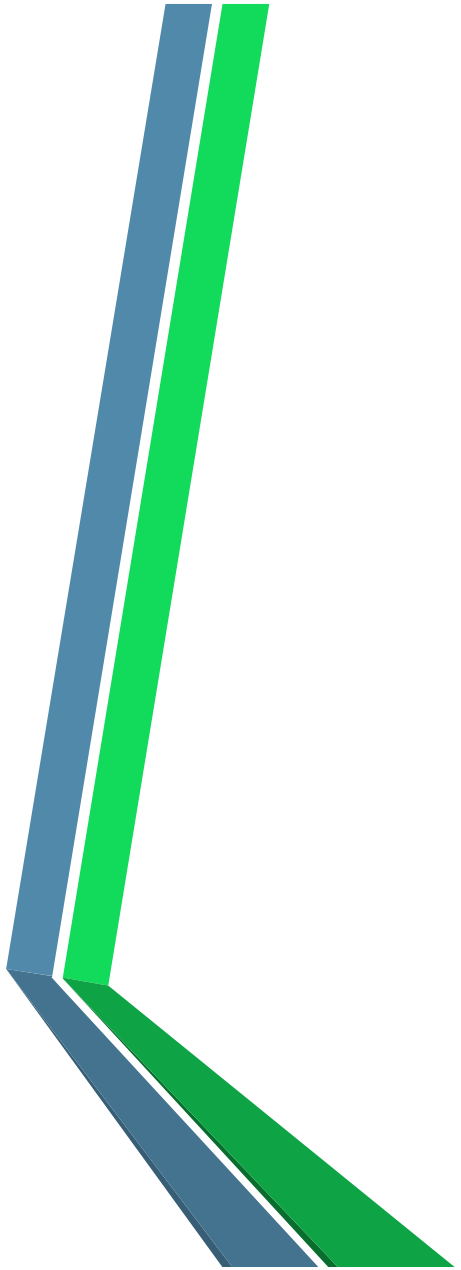
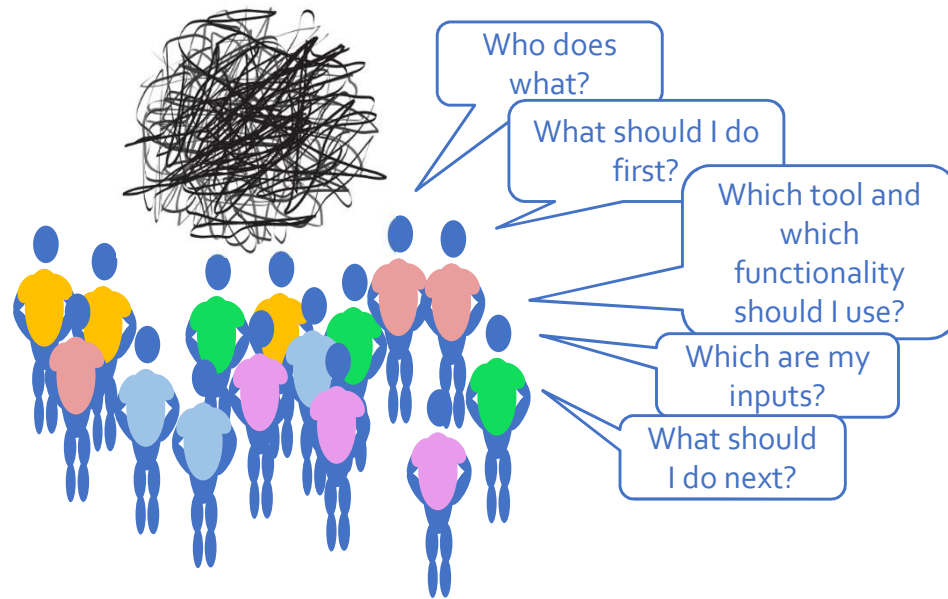
SAFETY COMPONENT CONTRACTS

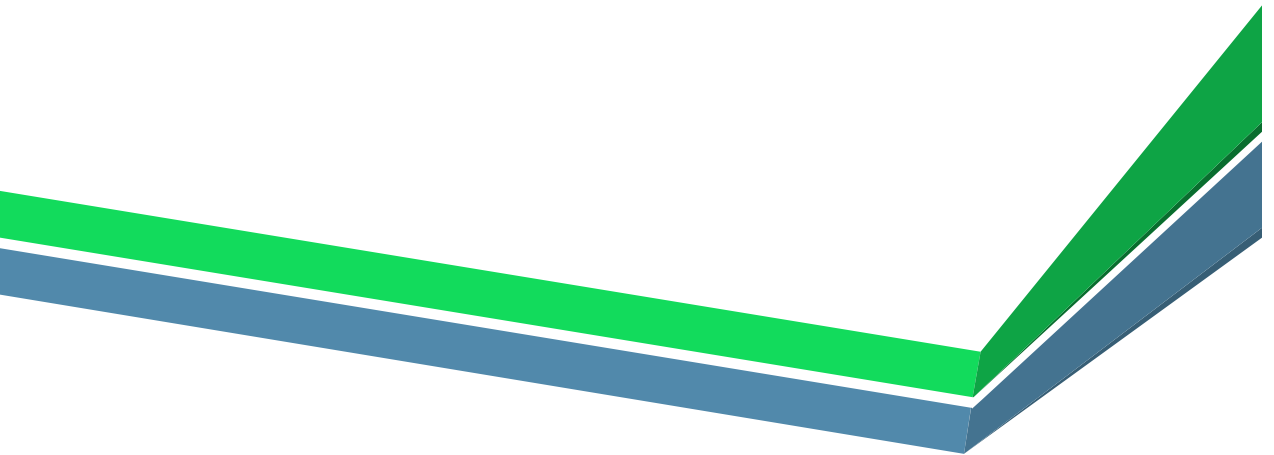
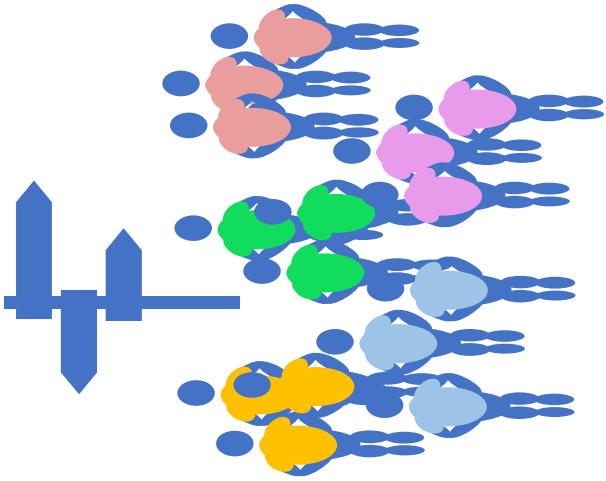


RobMoSys Ecosystem









Human Robot Interaction for Assembly



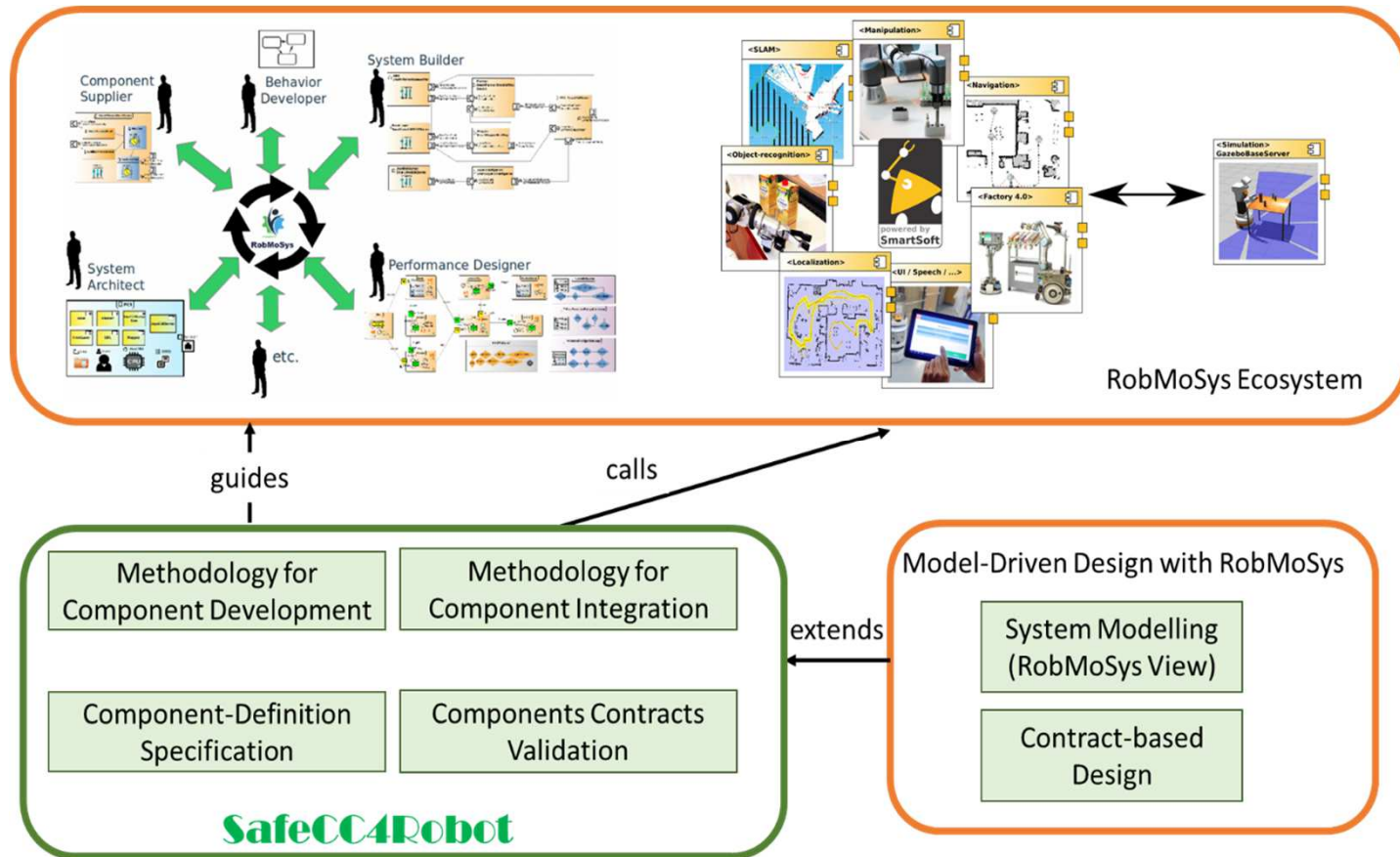
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SAFETY COMPONENT CONTRACTS

- Alice, Bob, Carol, Dan, Erin, Frank work in the Project with different roles:
 - Behavior Developer
 - Component Supplier
 - Function Developer
 - Performance Designer
 - Safety Engineer
 - Service Designer
 - System Architect
 - System Builder
- They are lost with the different RobMoSys tools when should they use each of them?

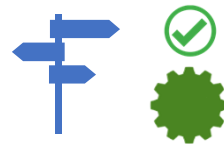
SAFETY COMPOSITIONAL METHODOLOGY

Approach



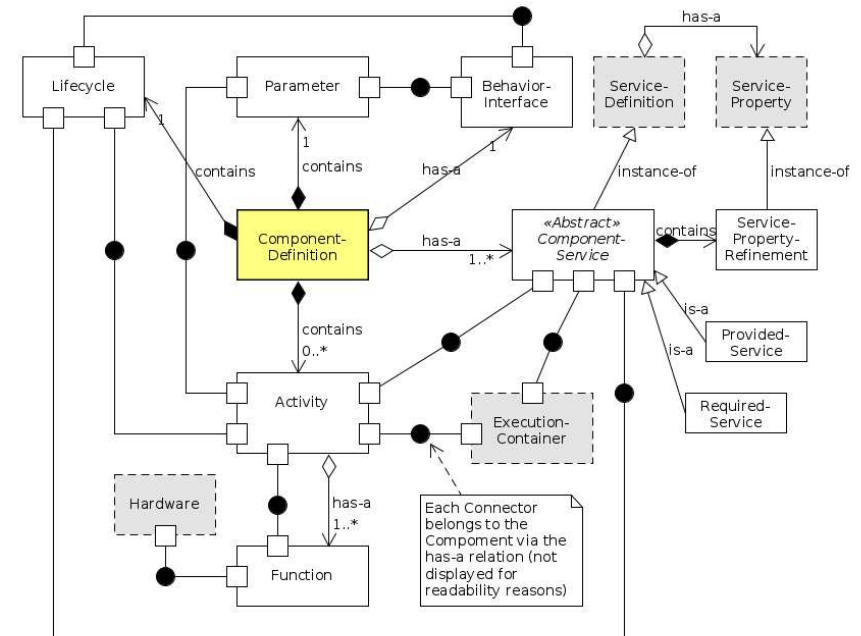
The SafeCC₄Robot project aims to

- create a methodology and tool support for creating components for robotics, ensuring safety at system level when those components are integrated.

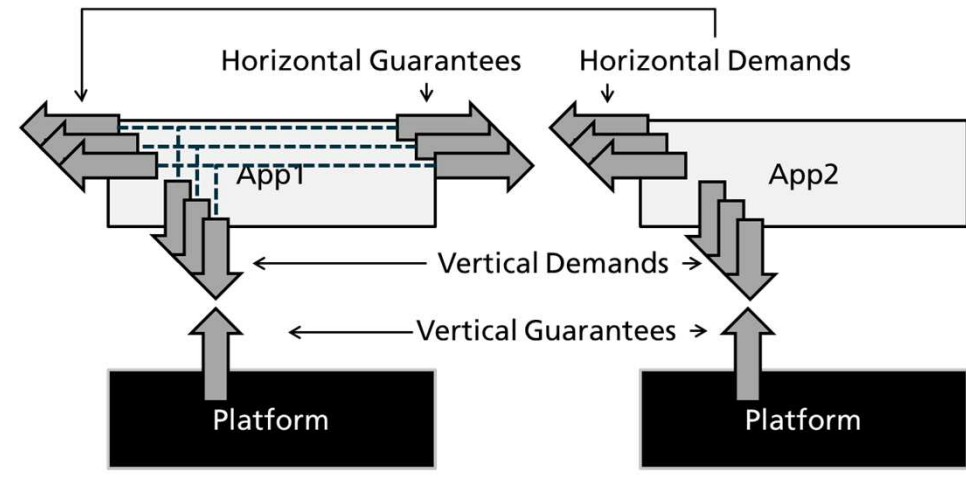
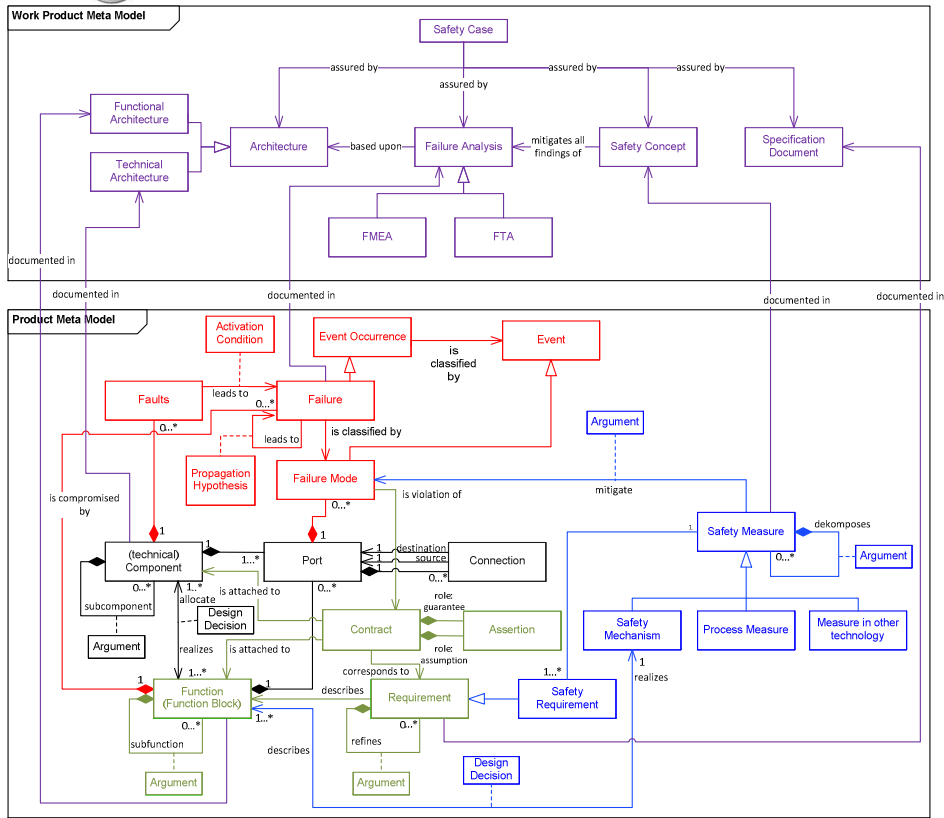


Entry point to the RobMoSys meta-models

- Component-Definition Metamodel
- System Component Architecture Metamodel



Some inputs



Tooling



RobMoSys

- OpenCert for compliance monitoring



- Compatible with Papyrus4Robotics

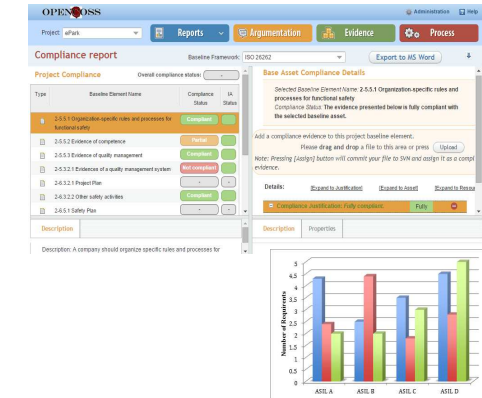


- Include a methodology dashboard



- Include a new contract view (contract definition and validation)

Service	ASL	Developer	Consumer	Validation	Discrepancy
apiProviderSecurity	D	ACC	ACC	false	
apiProviderInterface	C	ACC	ACC	false	
apiConsumerInterface	D	ACC	ACC	false	
apiProviderInterface	C		DivideInterface	false	
apiConsumerInterface	D		SystemModel	false	
communication_service (1)	D	ACC			
entity_provider_service (1)	D	ACC			
scheduling_service (1)	D	ACC			
entity_provider_health_monitoring (1)	D	ACC			
application_runtime_monitoring (1)	D	ACC			
communication_service (1)	D		Platform		
entity_provider_service (1)	D		Platform		
scheduling_service (1)	D		Platform		
entity_provider_health_monitoring (1)	D		Platform		
application_runtime_monitoring (1)	D		Platform		
resource_protection (1)	D		Platform		
entity_provider_service (1)	D		Platform		



Outcomes



- Safety methodological framework
 - Methodology for safety development
 - Tools to support functional safety compliance for robotics systems with OpenCert tool
 - Implemented components methodology follow support
- Components for safety composition
 - Extension of the RobMoSys Component specification to support contract-based design
 - Tools to support the RobMoSys Component specification extension
 - Tools to support the RobMoSys Components integration validation
 - Implemented components for demonstration robot controller





SafeCC4Robot



Thanks!

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 @S4robot



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