

RFP/RFC for Platform-independent Integration of SysML with Physical Interaction and Signal Flow Simulation Tools

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Overview

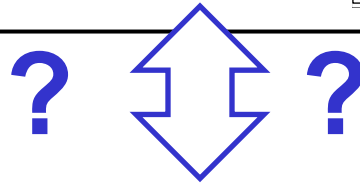
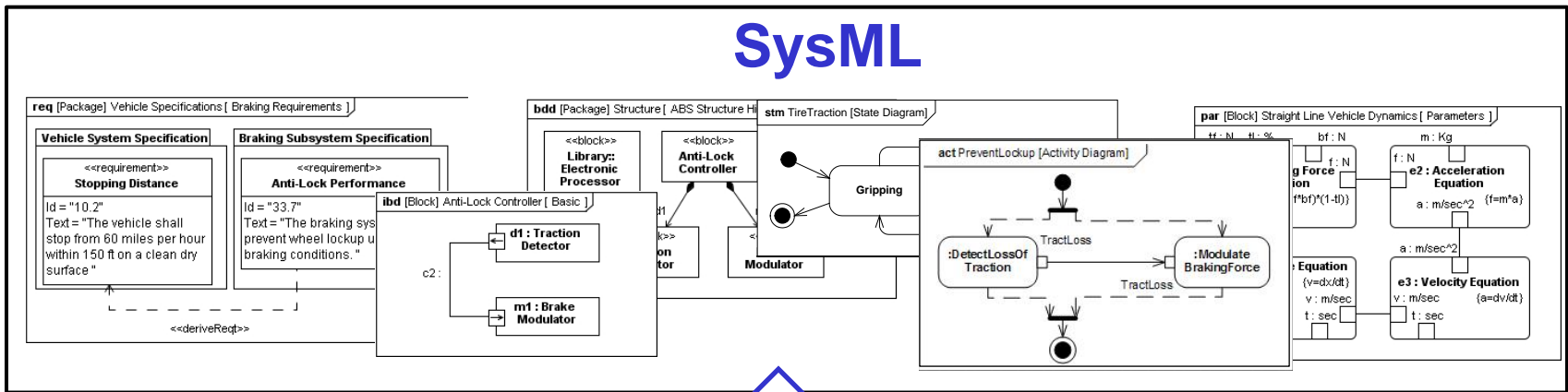
- **Review**
 - Motivation and approach
 - Physical interaction and signal flow simulation overview
 - RFP/RFC summary
- **Recent updates**
- **Questions / Discussion**
- **Summary**

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Physical Interaction and Signal Flow Simulation Language Integration

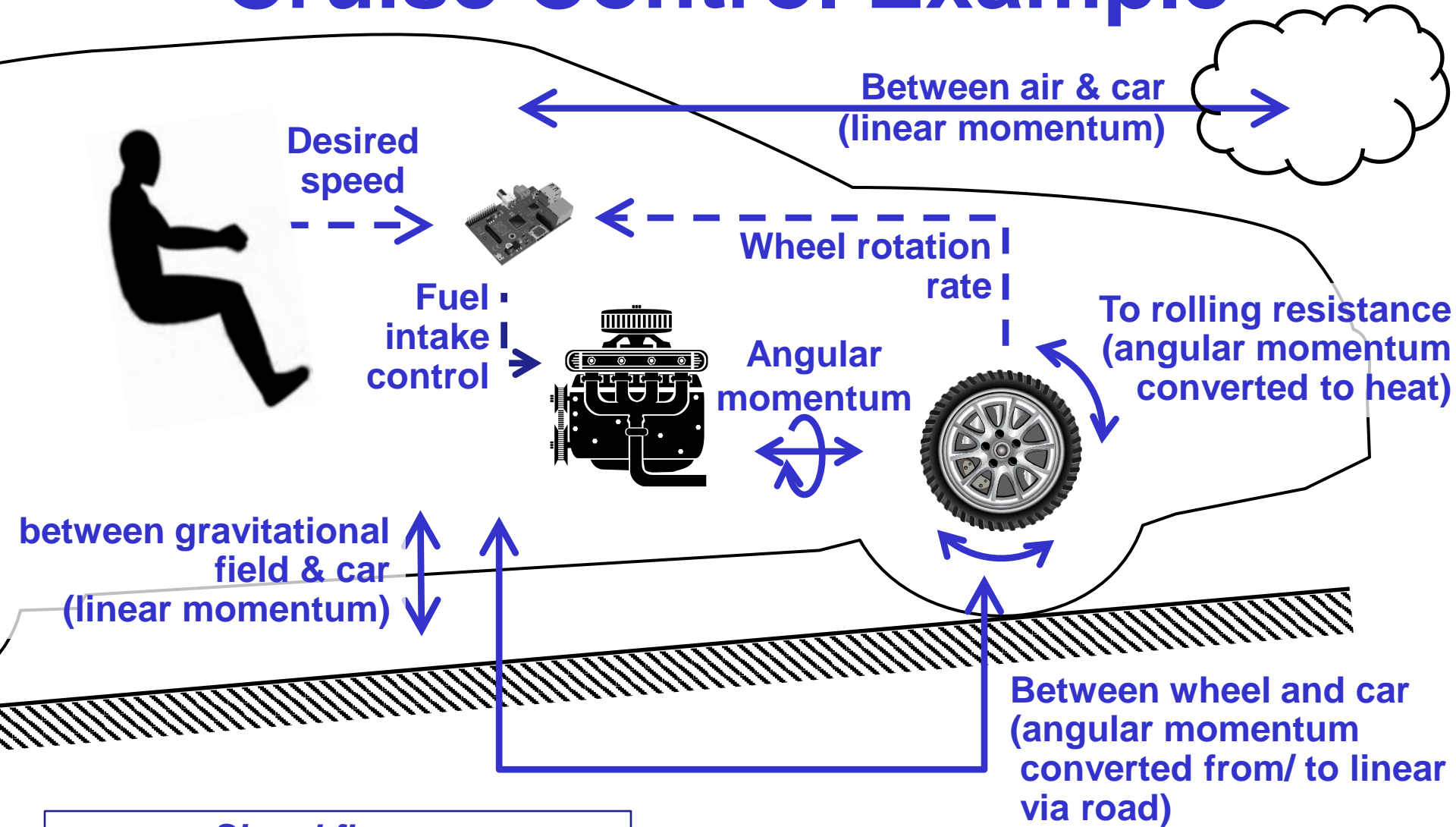
- Covers multiple engineering disciplines.
- Fewer languages involved.



PI & SF simulation languages & tools



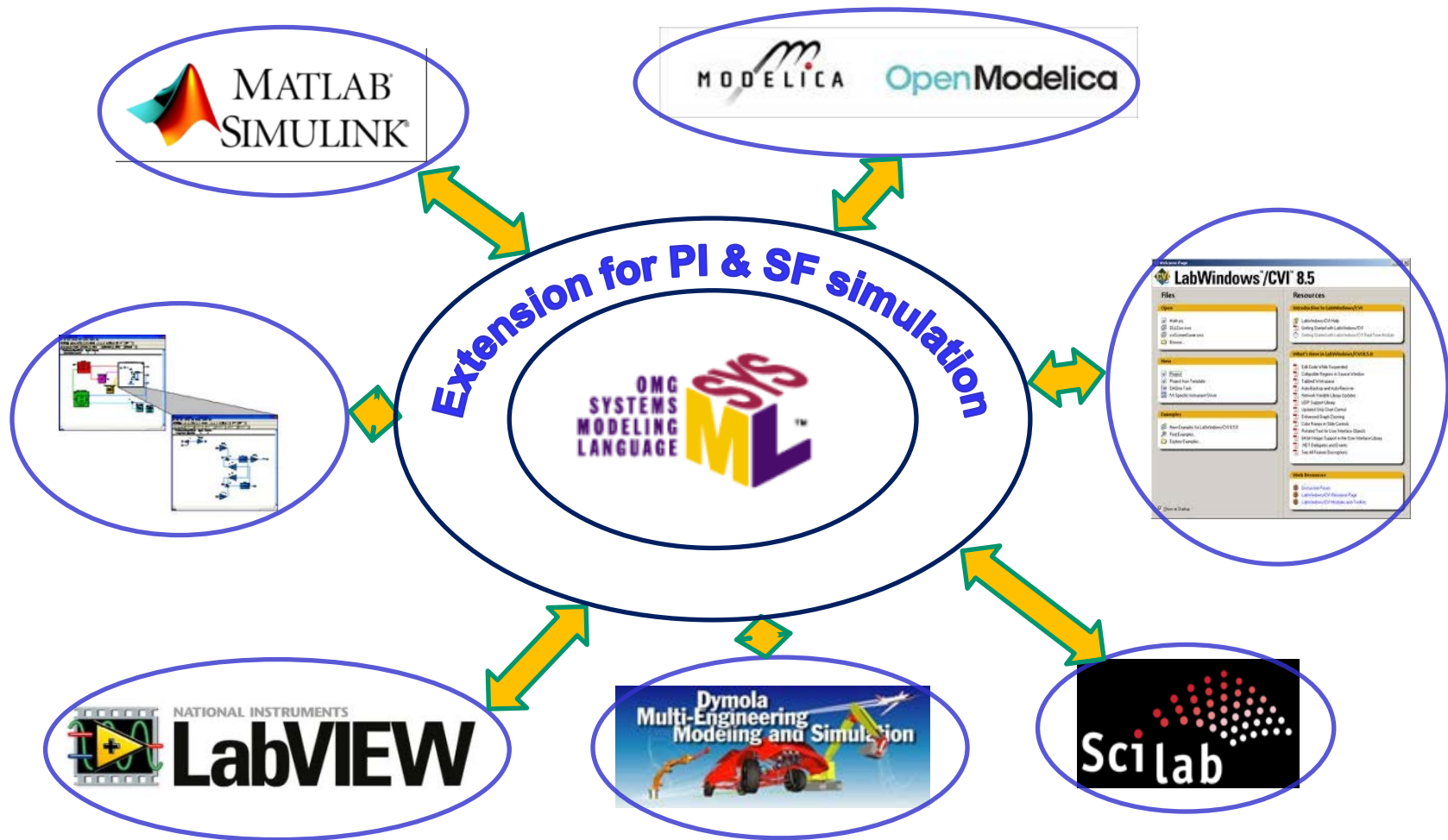
Cruise Control Example



Signal flow: - - - - ->
Physical interaction: <- - - - ->

- All flows modeled with rate & potential, regardless of what is flowing.

Reduce Specialized Mappings



- **Extend SysML with a general simulation profile.**

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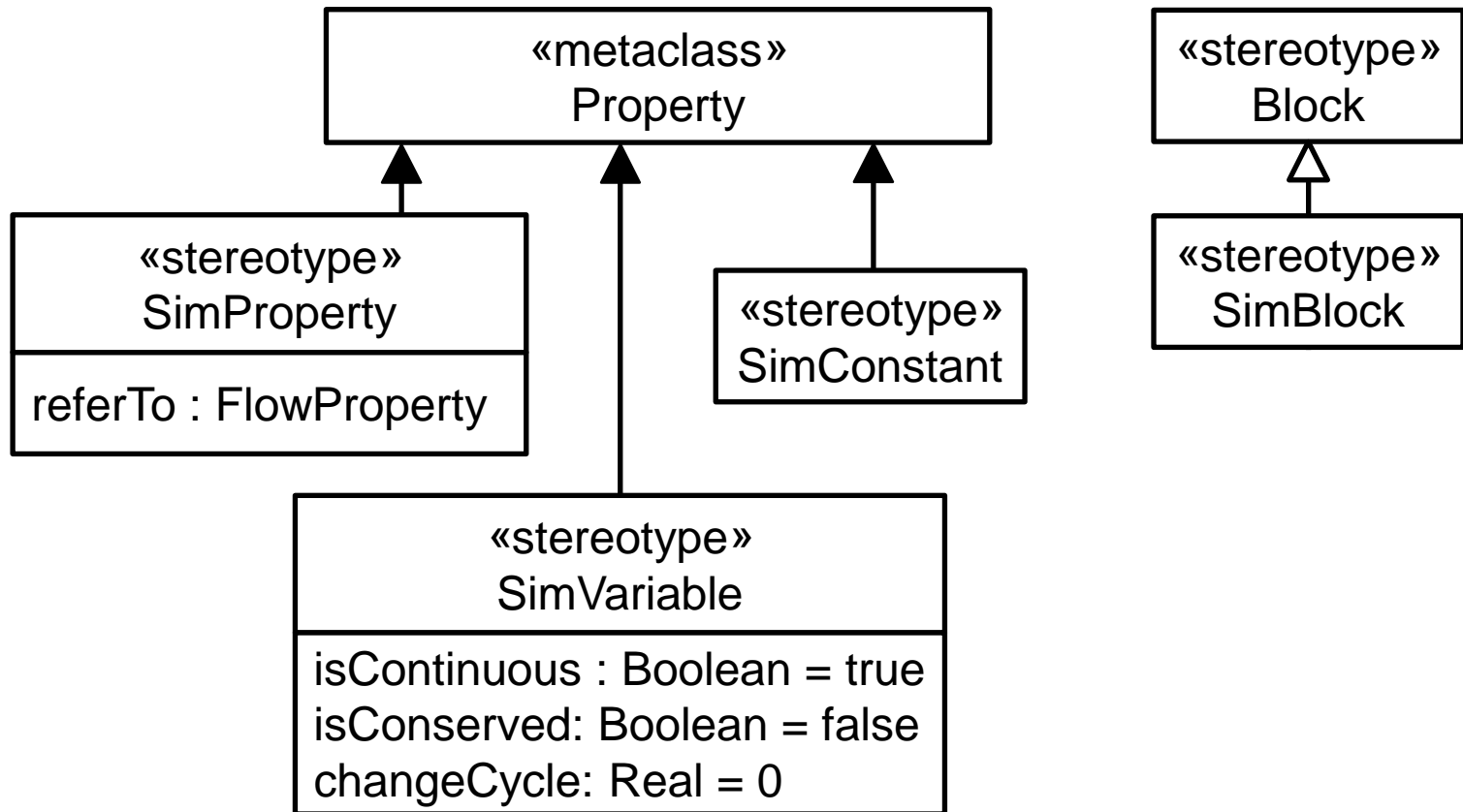
RFP: Objectives and Other Specs

- **Objective**
 - Extension of SysML supporting **tool-independent integration** with physical interaction and signal flow simulation models.
- **Relationship to other specifications**
 - **Modelica** is a simulation platform. **OMG SysML-Modelica** is a PSM.
 - **FMI** is for integrating executable simulation code, rather than system models and simulation models.

RFP: Mandatory Requirements

- **Stereotypes, textual equation syntax, and model libraries.**
- **Bidirectional mappings.**
- **Examples for widely-used simulation languages.**

RFC: Stereotypes



RFP: Optional & Evaluation

- **Optional features**
 - **Stereotypes for simulation inputs, solver directives, mappings for additional SysML constructs.**
- **Evaluation**
 - **More widely used simulation platforms.**
 - **More concepts from these platforms.**
 - **Textual equation syntax close to those platforms.**
 - **Fewer and less complicated stereotypes.**
 - **Provide more optional features.**

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Updates: RFP / RFC

- **RFP**
 - Small refinements.
- **RFC / Submission**
 - Brief tutorial
 - Signal flow example in Simscape.
 - Array / matrix support.
 - Fixes from testing (see implementation)
 - XMI files
- **<http://doc.omg.org/mantis/2015-12-01>.**

Updates: Implementation

- **Automated translation based on RFC**
 - **OMG-compliant SysML XMI to Modelica and Simulink / Simscape input files.**
- **MagicDraw plugin for running it.**
- **Brief MD-specific tutorial.**
- **This is not a recommendation regarding systems or simulation modeling tools.**
- **<http://doc.omg.org/mantis/2015-12-01>.**

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Question: RFP or RFC?

- **RFP**: Vendors develop their own submissions in coordination with supporters.
 - NIST would contribute it's work.
- **RFC**: Comment on draft RFC until it's ready to vote on.
- **Timeline**: Either way, vote in March is feasible.
- **Recommendation?**

Discussion: Mapping Formality

- **Formal mappings (eg, QVT), require standard simulation models.**
- **SysML-Modelica's has only UML diagrams**
 - **MOF metamodel is non-normative and not used in the transformations.**
- **Proprietary platforms (Simulink / scape).**

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Summary

- **SysML extension for physical interaction and signal flow simulation.**
 - Including equation syntax and libraries.
 - Simulation platform-independent.
- **Platform-dependent mappings and examples of their application.**
- **Mapping implementation available.**
- **RFP or RFC?**

More Information

- **Draft RFP, RFC, implementation:**
 - <http://doc.omg.org/mantis/2015-12-01>
- **OMG SysML Portal**
 - **SysML Extension for Dynamic Simulators**
 - http://www.omgwiki.org/OMGSysML/doku.php?id=sysml-dynamic-simulation:sysml_extension_for_dynamic_simulators
- **Conference paper available (draft journal paper on request).**
- **Followup telecon TBD.**