

Model Checking as a Service

Benedek Horváth



Lowcomote Project



"This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 813884".

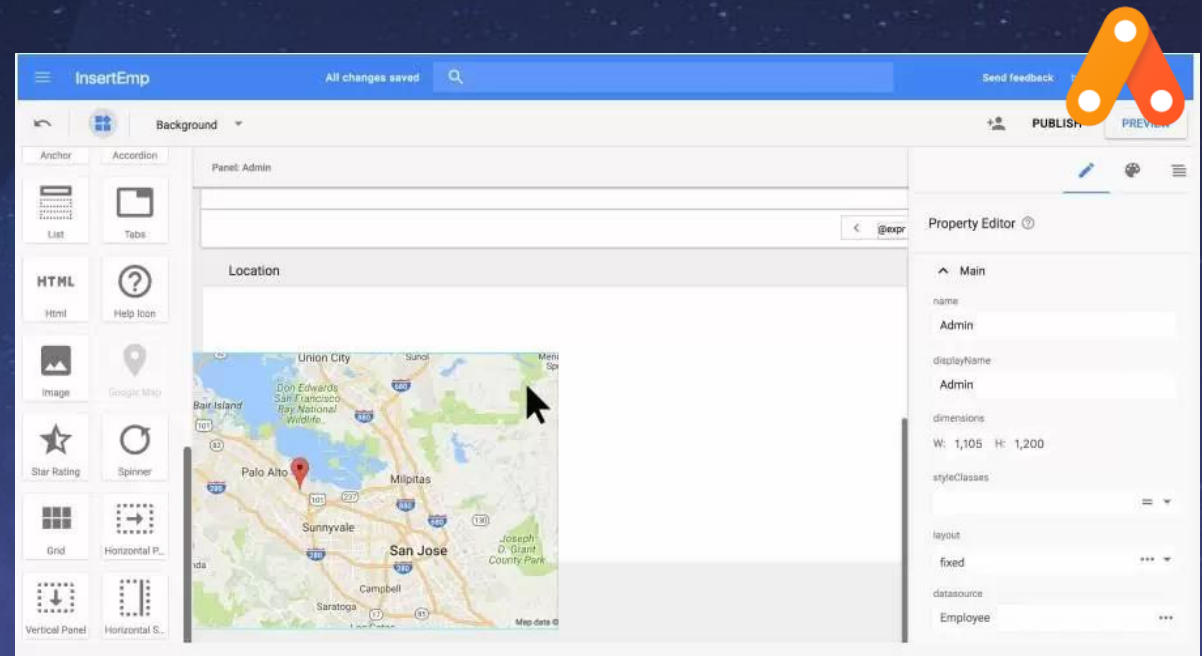


- EU project: 5 universities, 5 companies, 15 PhD students



Low-Code Development Platform

- WYSIWYG editor as GUI
- Connection of behavioral components
- Class diagram for data models
- More than 100 LCDPs [1]
- \$21 billion market in 2020 [2]

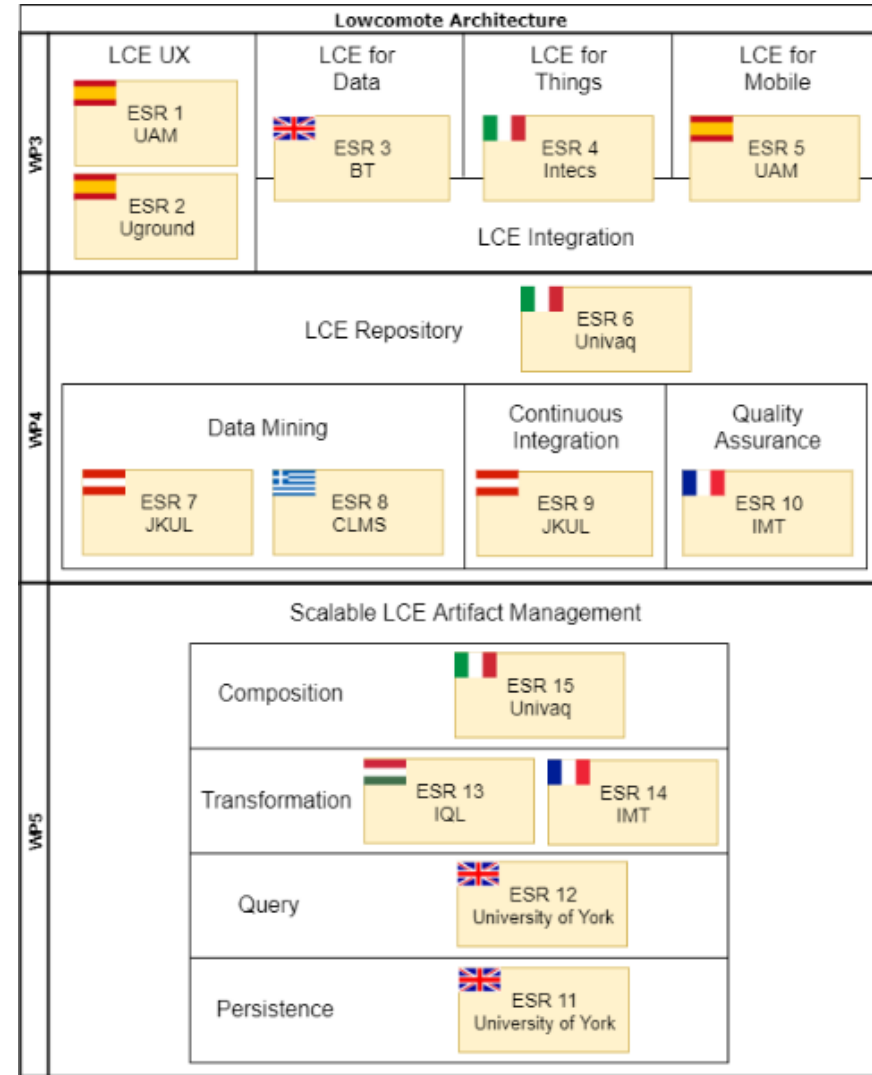
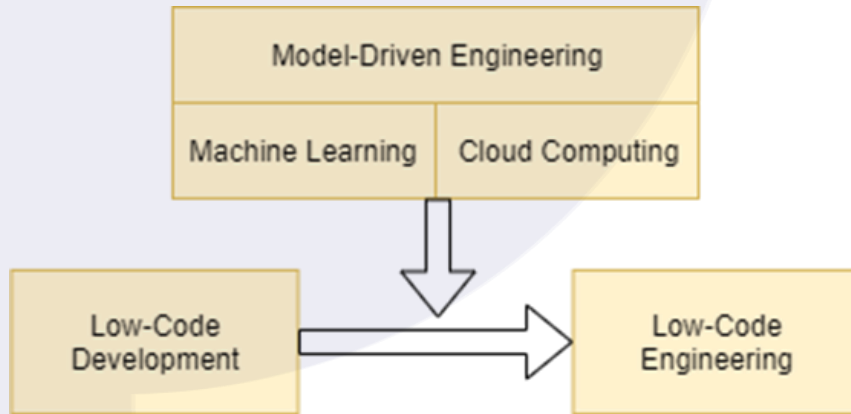


[1] <https://www.g2.com/categories/low-code-development-platforms>

[2] C. Richardson and J. R. Rymer. The Forrester Wave: Low-Code Development Platforms, Q2 2016. Tech. rep. Forrester Research, 2016.



Lowcomote: Low-Code Engineering Platform



Live Model Transformation for Distributed Low-Code Platforms

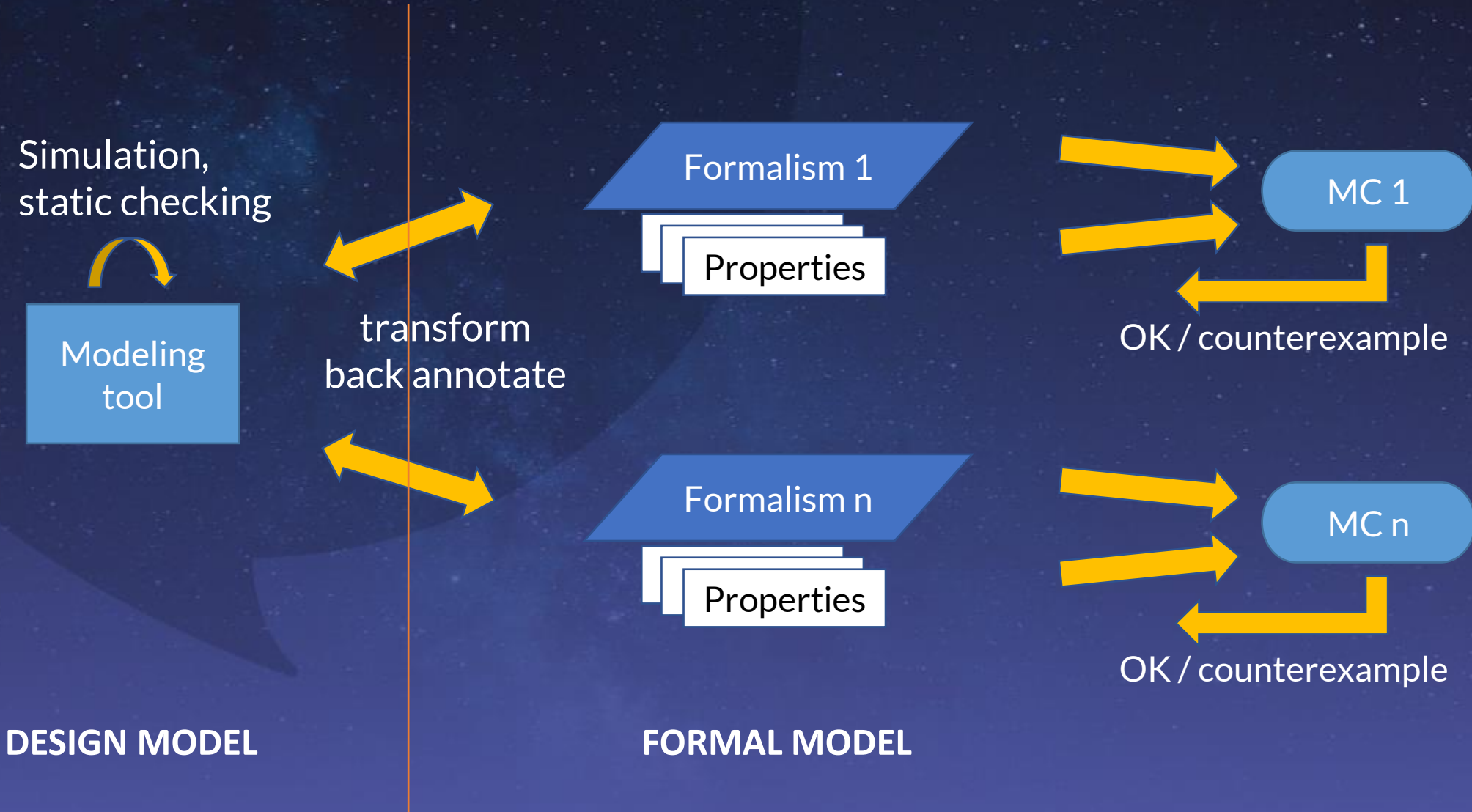
- Advisors:
 - Prof. Manuel Wimmer (JKU)
 - Massimo Tisi (IMT Atlantique)
 - Ákos Horváth PhD, István Ráth PhD (IncQuery Labs Ltd.)
- Model transformations on very large and distributed models
- Very large projects / models: 100M+ elements
- Live, reactive model transformations
- Parallel and distributed platform
- Traceability and debugging for executing parallel and distributed MTs



Case Study: Model Checking as a Service



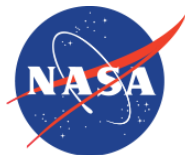
Motivation



Motivation

- MagicDraw: comprehensive tool to design, simulate SysML models
- Testing, simulation \neq formal verification
- Errors may remain in the model
- Need for automated model checking
 - Formal assertions on properties to be proved on the model
 - Different model checkers for different formal assertions

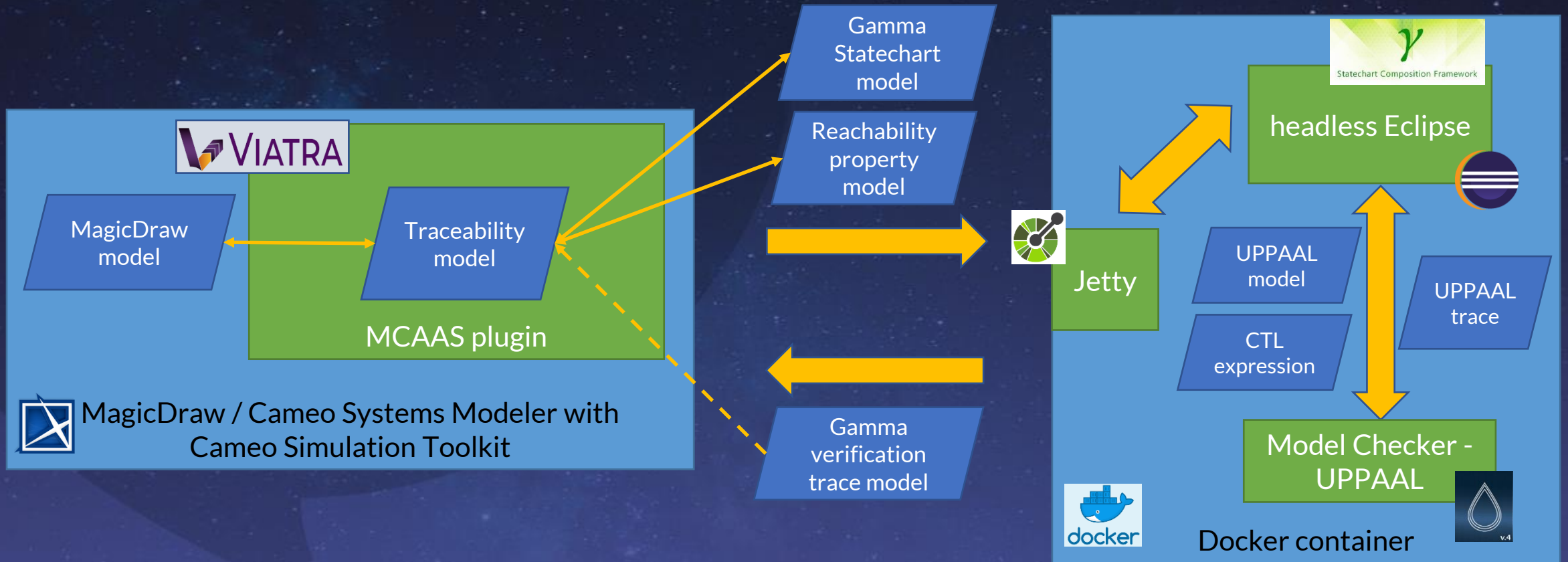
• Partners:



Jet Propulsion Laboratory
California Institute of Technology



Architecture



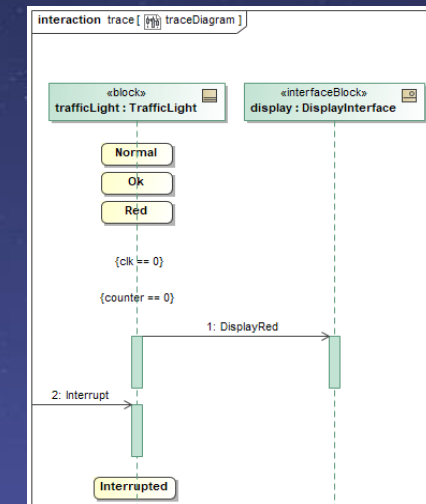
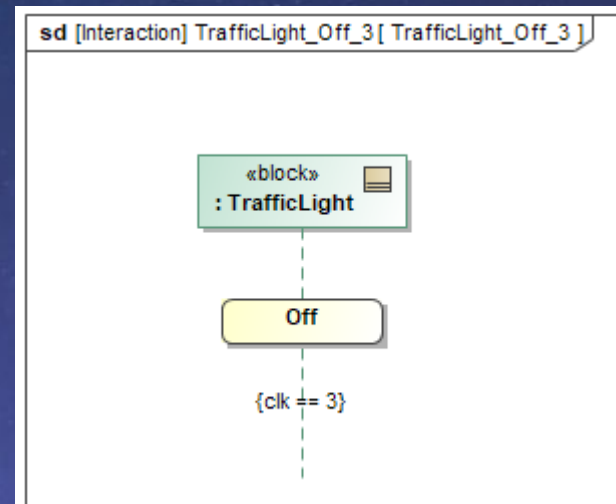
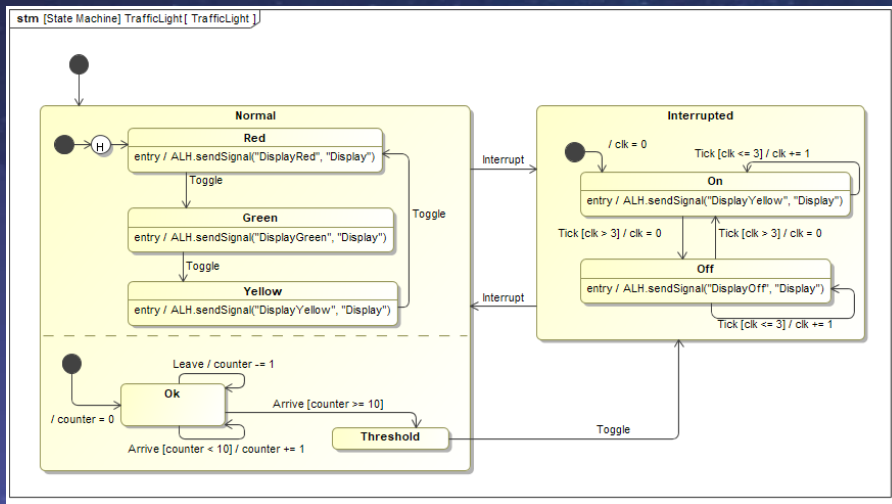
Proof of Concept

- Reachability properties
- 1 state machine:
 - States: hierarchical with parallel regions (no shared variables)
 - Entry / exit actions: Java Script (cf. transition effects)
 - No do action
 - Transitions:
 - Trigger: no trigger or signal
 - Guard: Java Script expressions using variables (simple, atomic, bounded)
 - Effects:
 - JavaScript statements using variables (simple, atomic, bounded)
 - no loops
 - send signal on port
- Data variables: Boolean or integer
- No time constraints



DEMO

- Model: 1 hierarchical state machine with signals from environment
- Validate model
- Check various reachability properties
- Visualize trace as sequence diagram



Future Work

Simulation,
static checking



Modeling
tool

CURRENT STATUS

Simulation,
static checking



Modeling
tool

Model
upload



Static checking



Model store,
query & trans.

Verification start,
result view



Browser

FUTURE PLAN



Thank you for your attention!
Have a great day!

