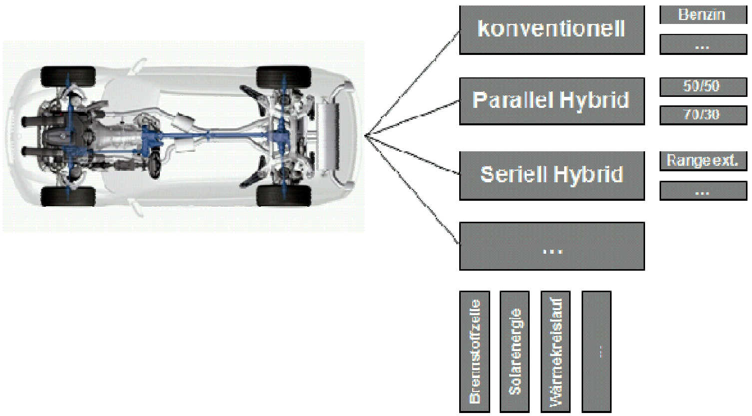
Selecting an Optimal Hybrid Car Configuration by means of a Simulation Automation System



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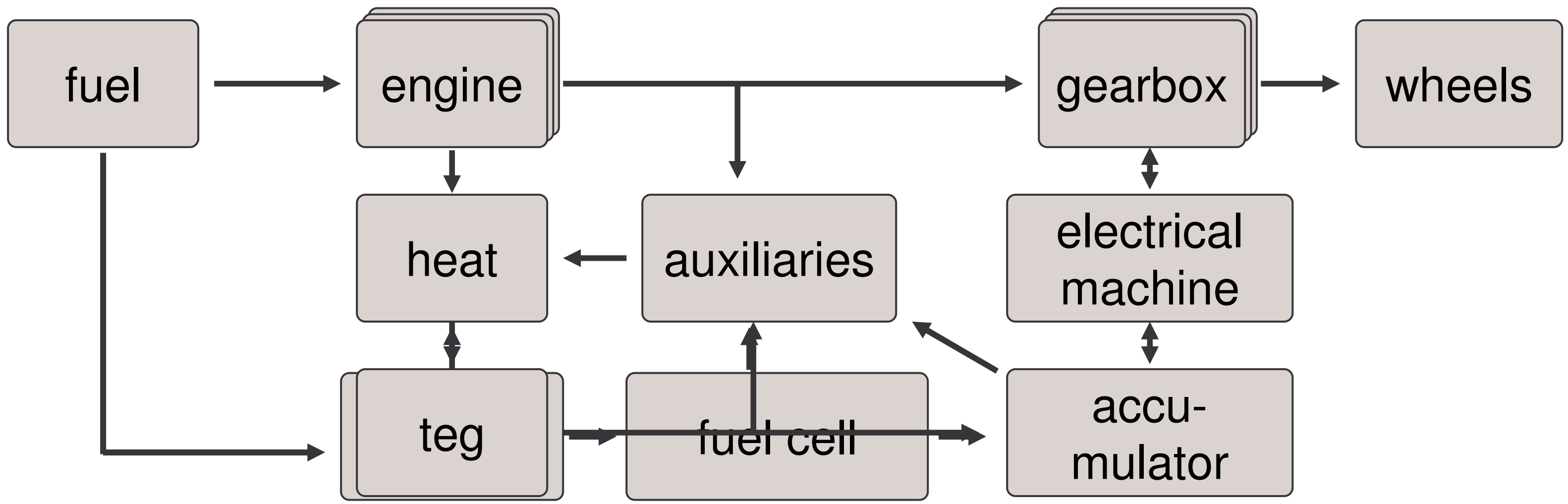
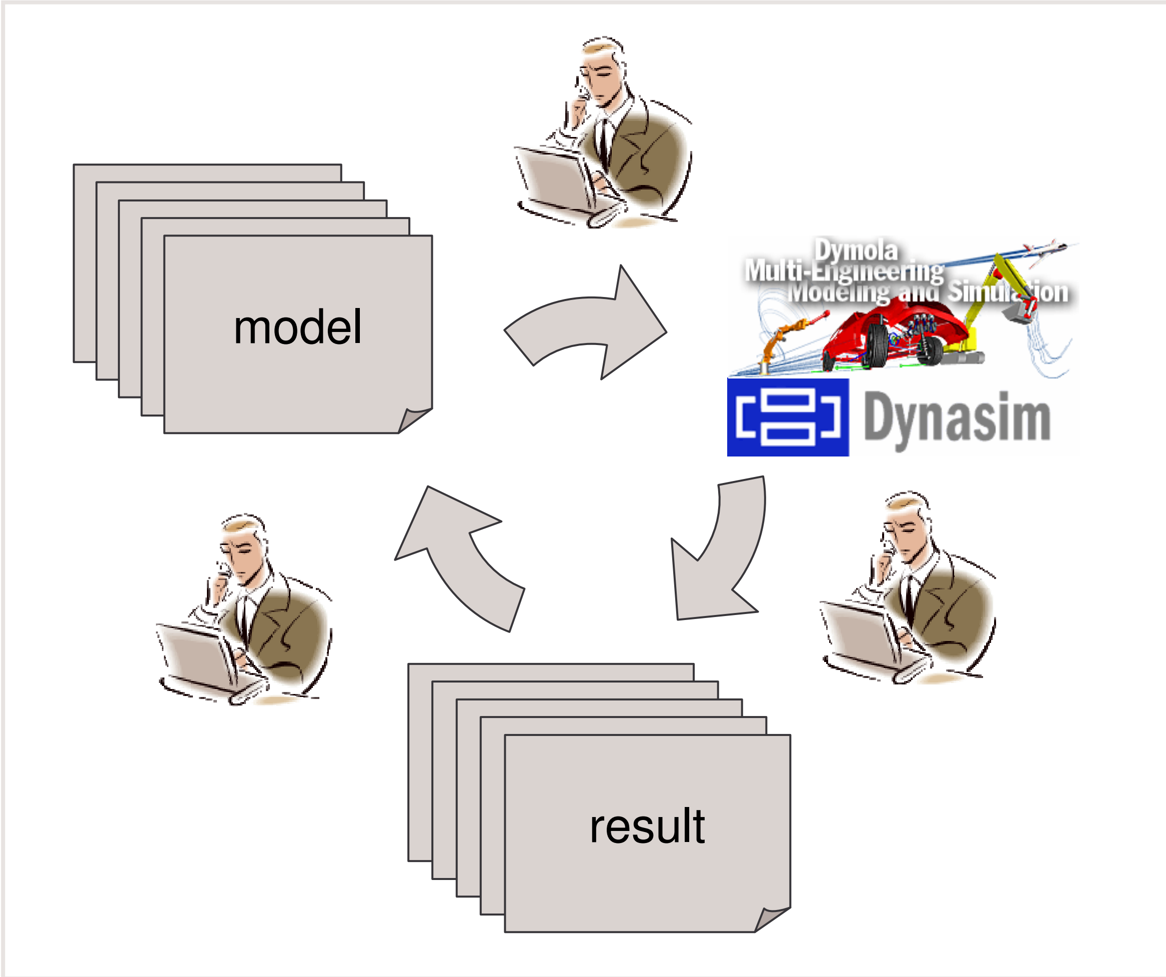
Selecting an Optimal Hybrid Car Configuration by means of a Simulation Automation System

- motivation
- concept
- procedure
- realisation
- conclusion

Various possible hybrid car configurations



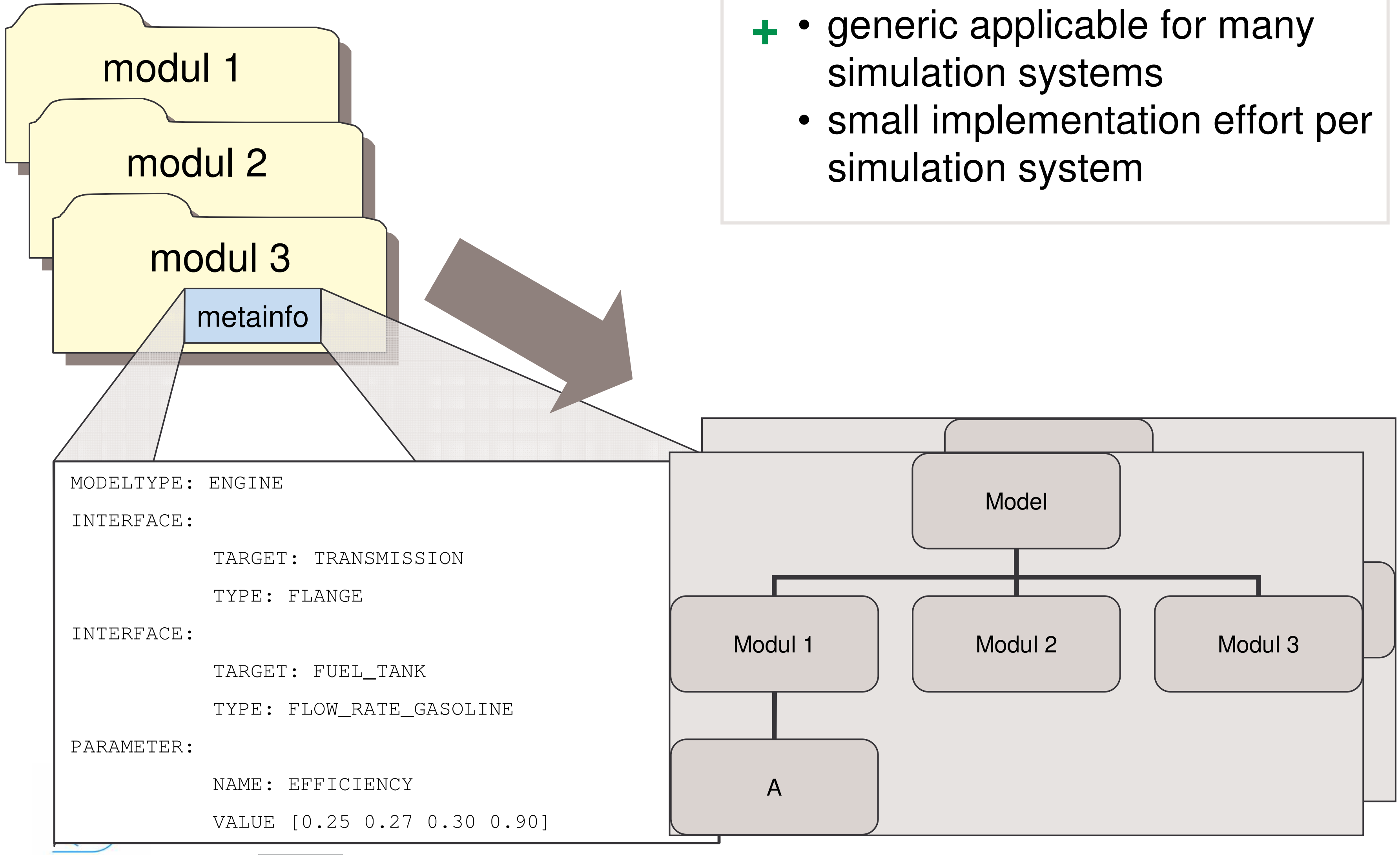
Tool for automation of Simulation Studies



Concept of a Simulation Automation System (1/2)

generic generation of car configurations out of modules

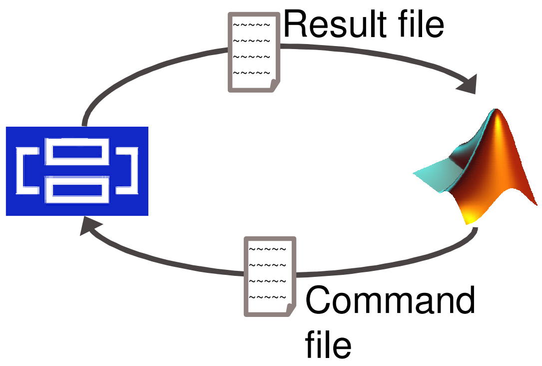
\+ • generic applicable for many simulation systems
• small implementation effort per simulation system



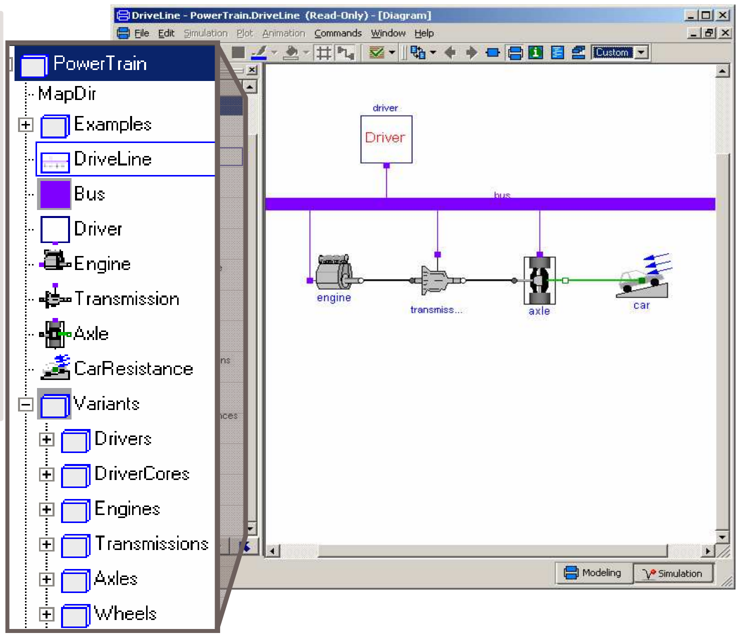
Concept of a Simulation Automation System (2/2)

Approach:

- Simulation system: Dymola
- Simulation automation system: Implemented in Matlab MATLAB
- Coupling via command and result files



- Use of Dymola Powertrain library, which contains subcomponents, like comb. engines
  - DRIVER: 2
  - ENGINE: 1 (+1)
  - TRANSMISSION: 3
  - AXLE: 2
  - CARRESISTANE: 2

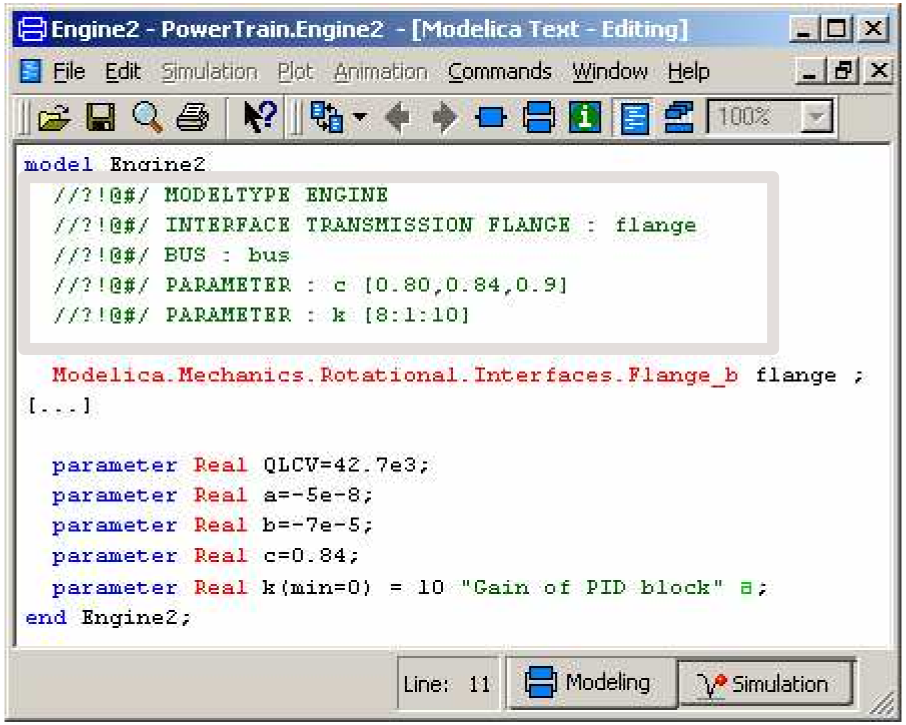


Procedure of the Simulation Automation System (1/2)

Prearrangement:

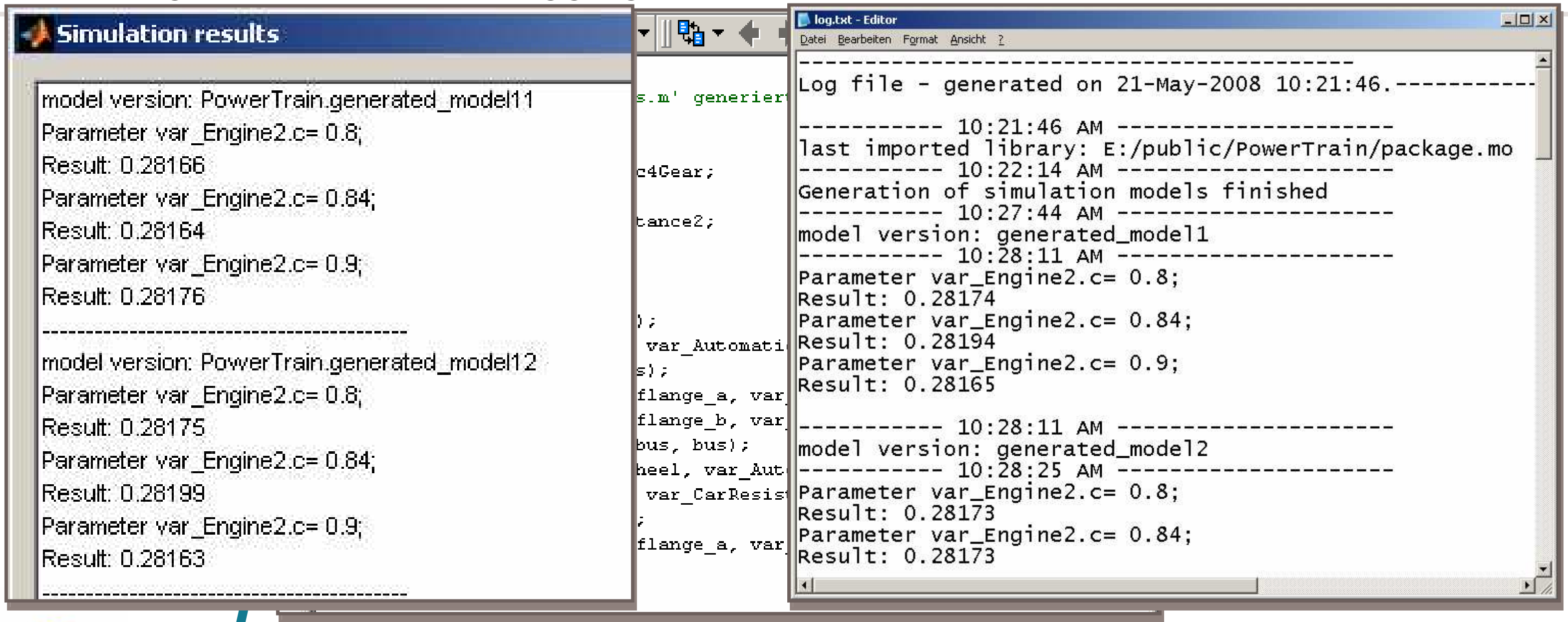
- Modifying the Powertrain library: Additional information for model generation in each module

```
model engineA

// accessory model information
MODELTYPE: ENGINE
INTERFACE:
        TARGET: TRANSMISSION
        TYPE: FLANGE
PARAMETER:
        NAME: EFFICIENCY
        VALUE: [0.25 0.27 0.30 0.31]

// physical description
(tau*w) = (fuelflow*calorific_value) * efficiency
…
end engineA
```

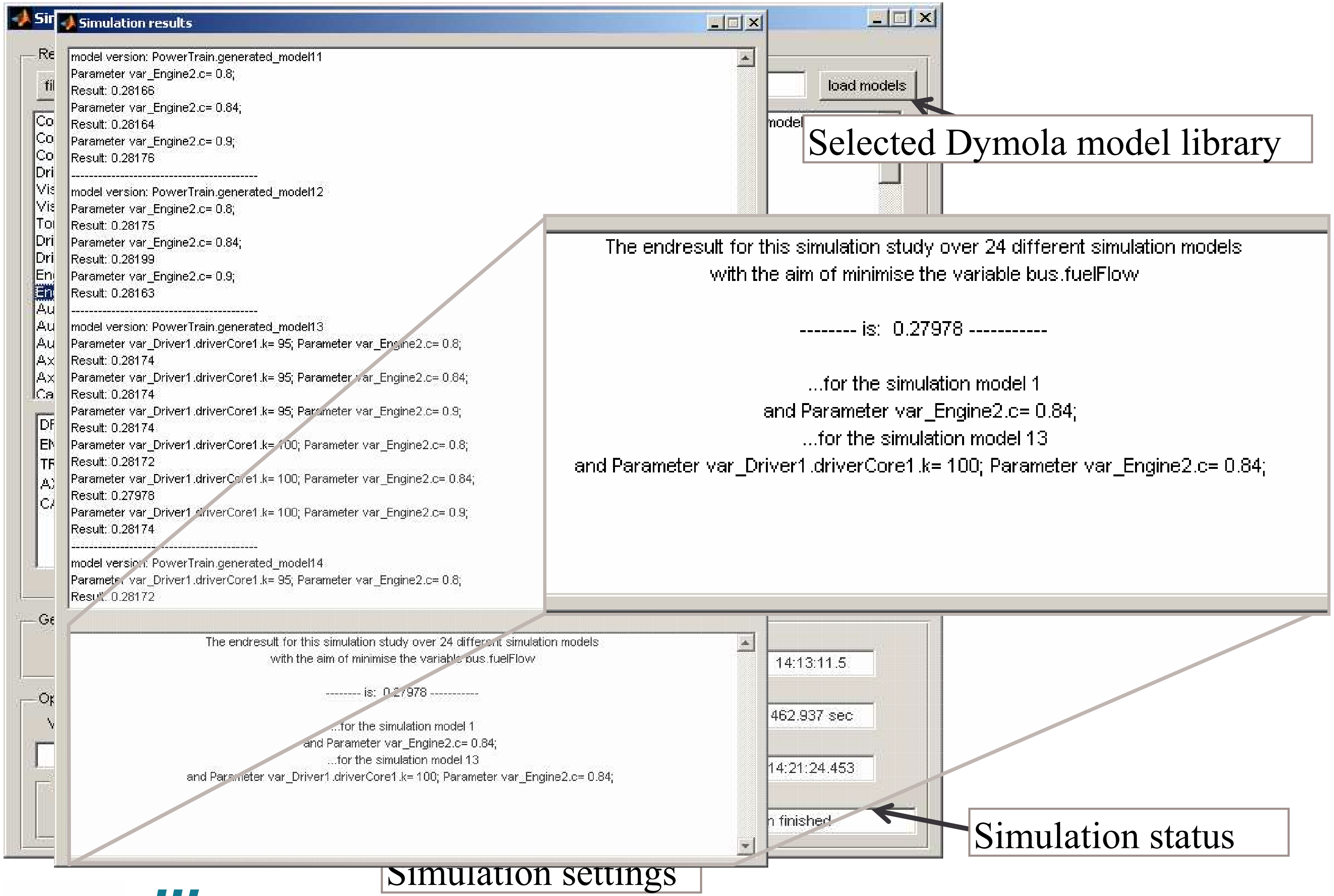


Procedure of the Simulation Automation System (2/2)

- Importing of library:
  - SAS parses indicated library and extracts mudules
- Generation of simulation models
  - SAS generates possible model alternatives
- Parameter variation and running simulations
  - Generation of Dymola scripts for each simulation model
  - Running simulations and logging results



Screenshots of the Simulation Automation System



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conclusion

- A tool for automated execution of simulation studies was introduced
- The focus of that tool is the possibility to automatically generate car model variations
- The first prototype of the tool was implemented and demonstrated
- further works:
  - Import model interfaces out of modelica models
  - Include automated parameter variation and optimization on the generated car models
  - intelligent reduction of variants
  - parallel execution of different stucture models with the help of grid technologies
  - improve framwork and user interface

Thank you for your attention