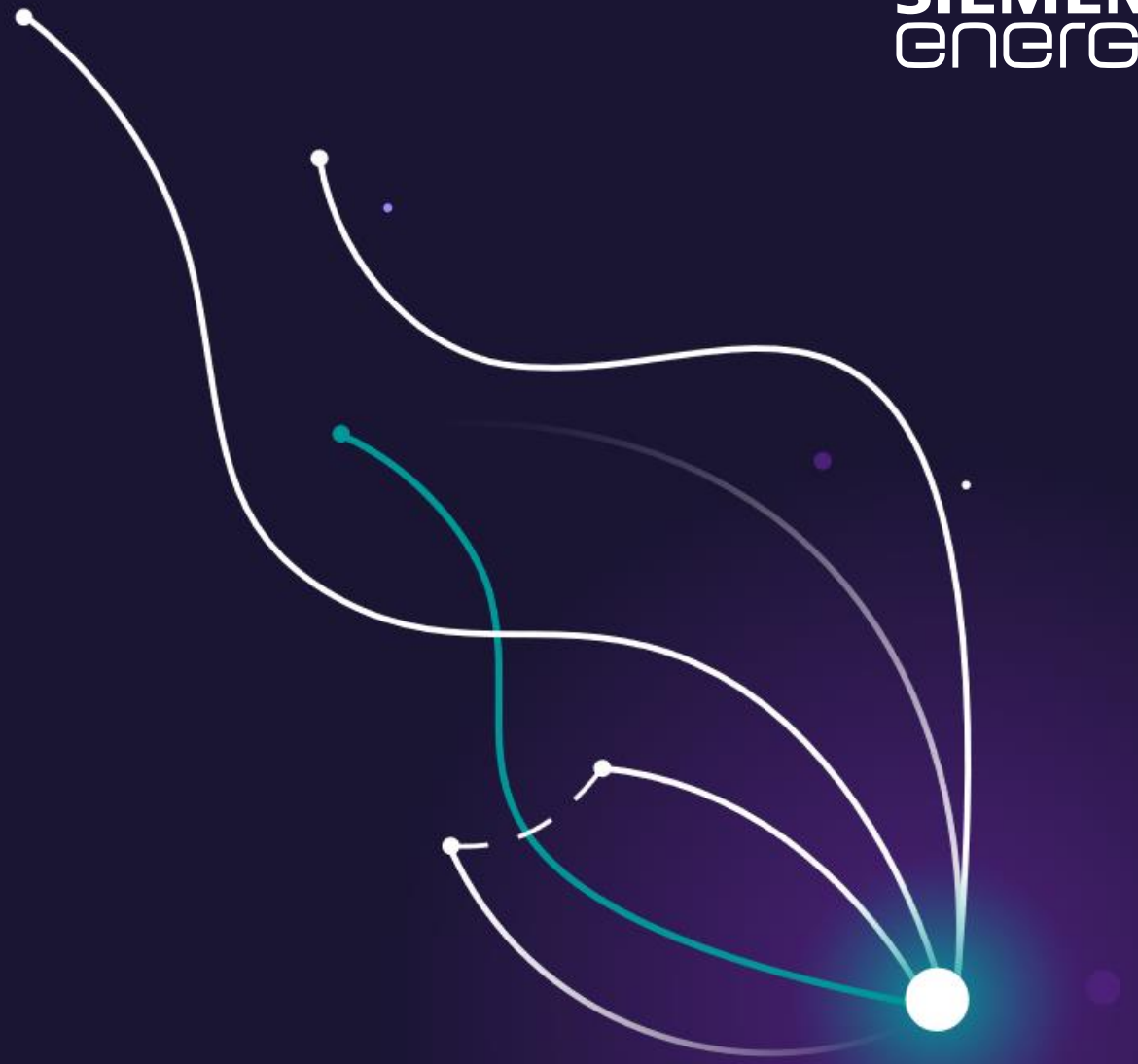
Anfahroptimierung von GuD-Kraftwerken

Umgebung um das Modelica-Modell



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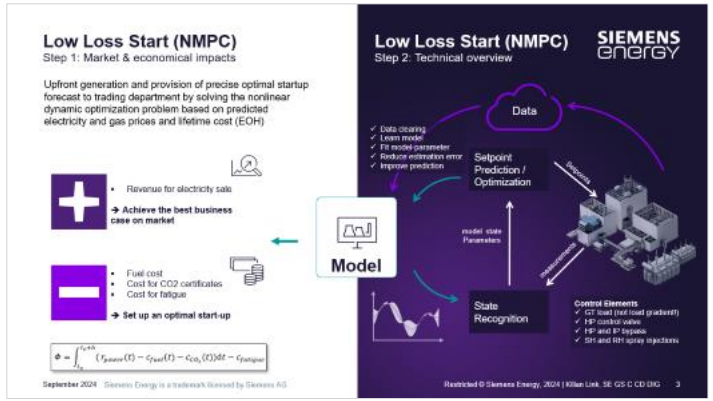
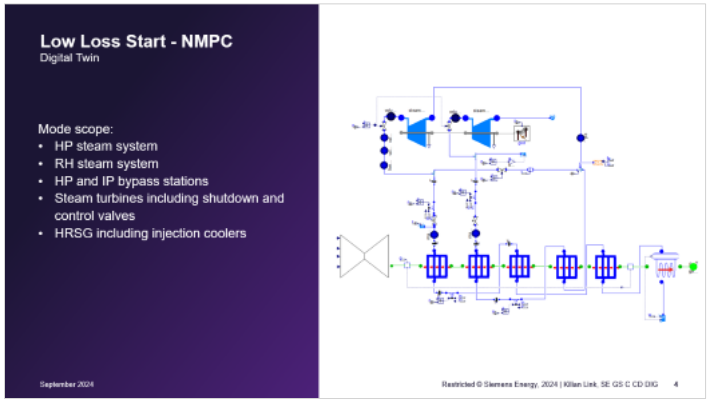
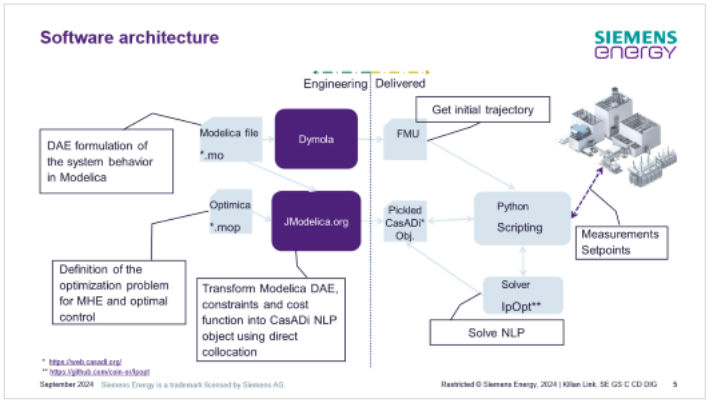






Low Loss Start (NMPC)

Step 1: Market & economical impacts

Upfront generation and provision of precise optimal startup forecast to trading department by solving the nonlinear dynamic optimization problem based on predicted electricity and gas prices and lifetime cost (EOH)

- Revenue for electricity sale

➔ **Achieve the best business case on market**

- Fuel cost
- Cost for CO2 certificates
- Cost for fatigue

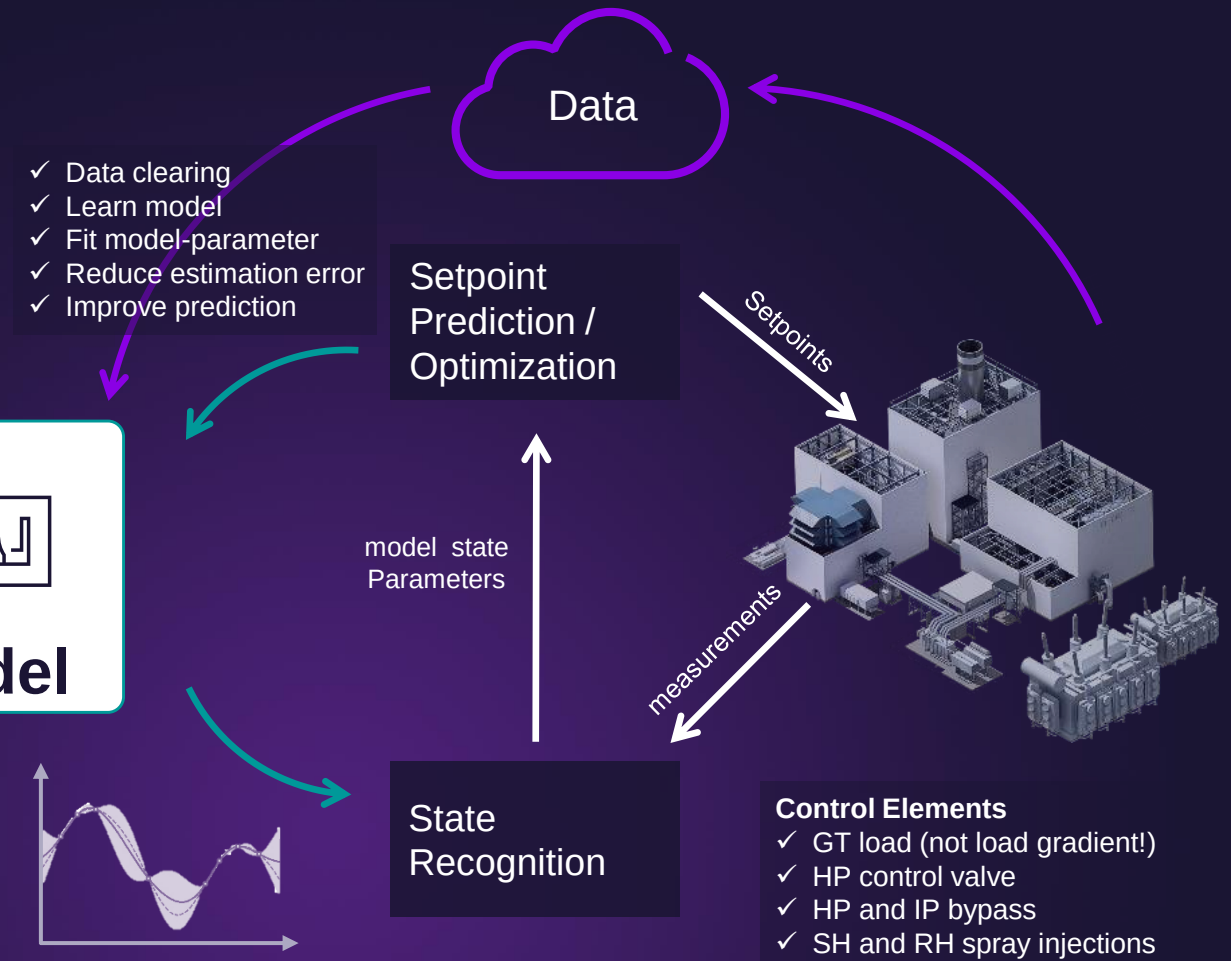
➔ **Set up an optimal start-up**

$$\Phi = \int_{t_o}^{t_o+h} (r_{power}(t) - c_{fuel}(t) - c_{CO_2}(t))\mathrm{d}t - c_{fatigue}$$

Low Loss Start (NMPC)

Step 2: Technical overview

SIEMENS energy

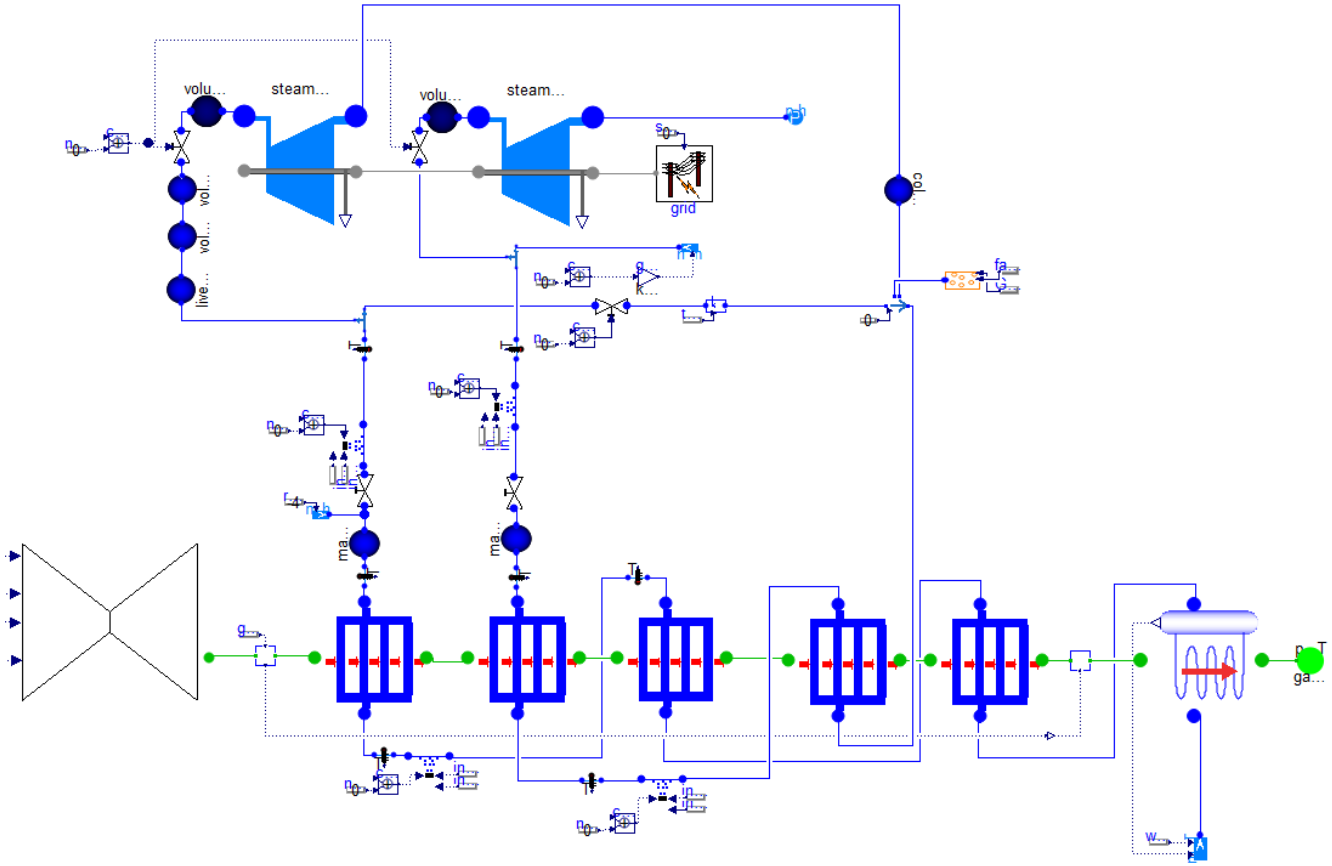


Low Loss Start - NMPC

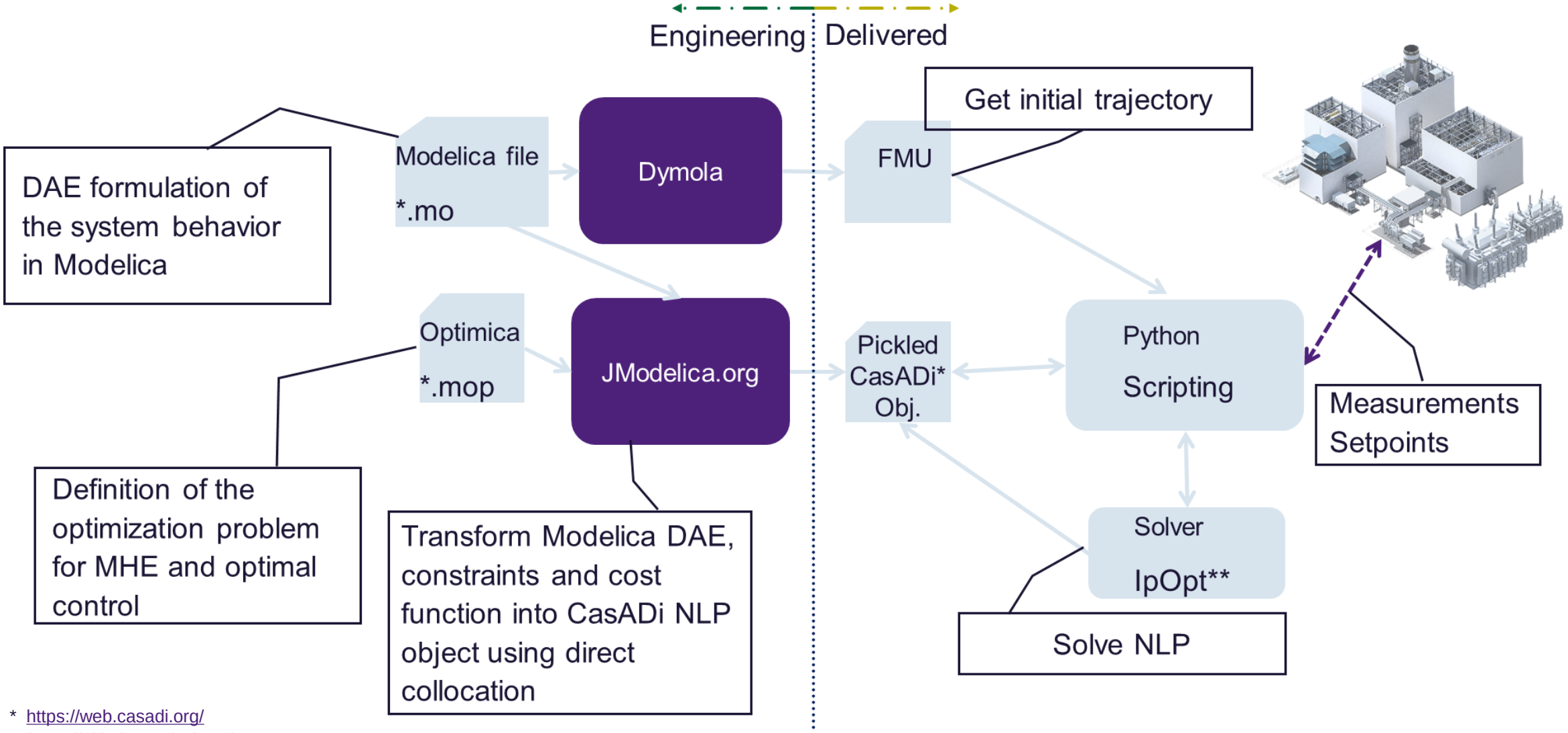
Digital Twin

Mode scope:

- HP steam system
- RH steam system
- HP and IP bypass stations
- Steam turbines including shutdown and control valves
- HRSG including injection coolers



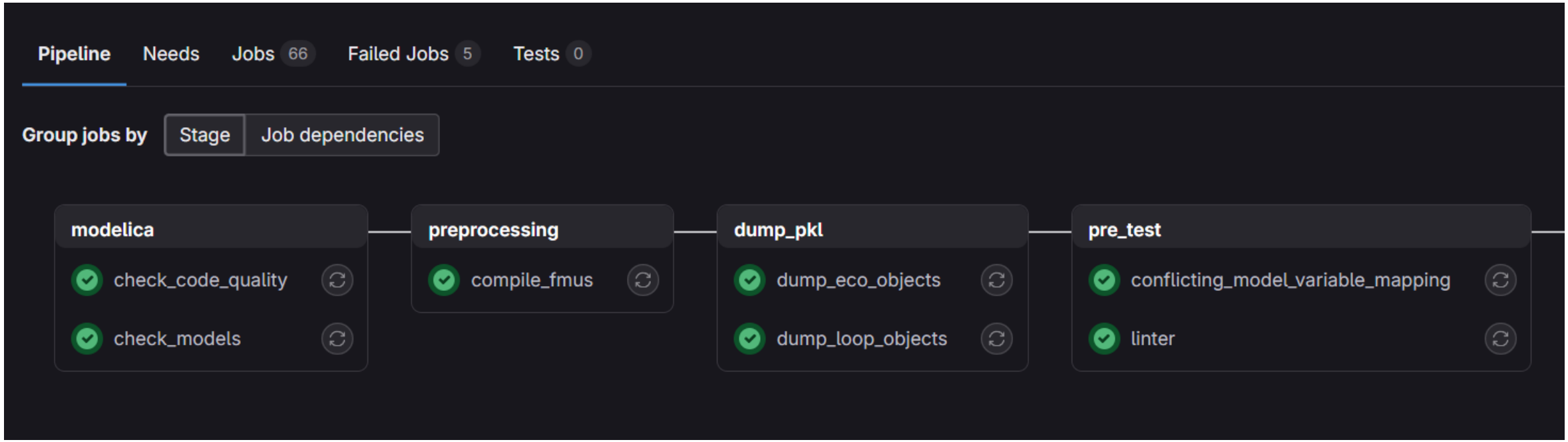
Software architecture



* https://web.casadi.org/
** https://github.com/coin-or/Ipopt

First, modelica tools are compilers

Extract from the gitlab pipeline



Compared to other compilers the license situation of the compiled artifacts in the Modelica case is extremely complicated and needs special license agreements.

Unresolved problems and the search for partners

Technologien von Interesse

- Economic operations Optimization.
- Non-linear model predictive control (NMPC).
- JModelica.org (and forks from here)
- CasADi or Julia
- OPC UA
- Water steam properties for optimization (sufficiently smooth).

Persistent problems

- Modelica(suitable Dymola parameter) and git.
- Model validation and model KPI.
- Similar projects with small differences.
- Cross error detection in measurement and how to deal with faulty measurements in general.
- Limited model validity (e.g. due to water steam properties).

Contact page

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