Computer System for Flexible Design of the Hot Strip Rolling Mill Design based on Data Farming

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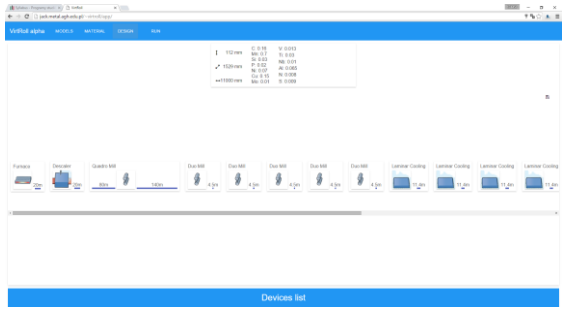
ACK CYFGRONET AGH

Objectives of the work

The main objective of the project is the development of a model-based predictor computer system, supporting the flexible design of strip rolling, joining functionality of numerical simulations, material modelling (metamodelling), sensitivity analysis and optimization to minimize costs related to the design of production processes and to optimize the properties of semi and final products.

Introduction – system architecture

Browser



Mill design description
JSON file

High Performance Computing

- FEM based software
- Computing models (shared libraries)
- Additional apps: **optimization, sensitivity analysis, metamodelling**

WWW server

- Material definition
- Model selection and upload
- Design of the mill
- Configuration of calculations
- Submission of computing tasks

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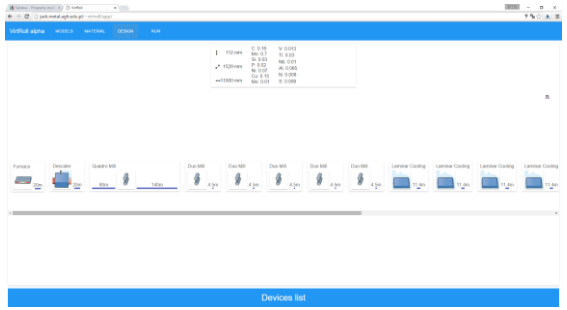

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High Performance Computing

Middleware Scalarm

WWW server

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- Authentication
- Authorization
- Preparation of computing tasks
- Design of experiment
- Management of computing tasks
- Download of results

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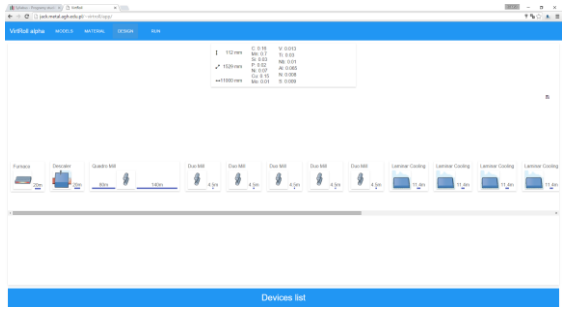

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EDA
Knowledge Base

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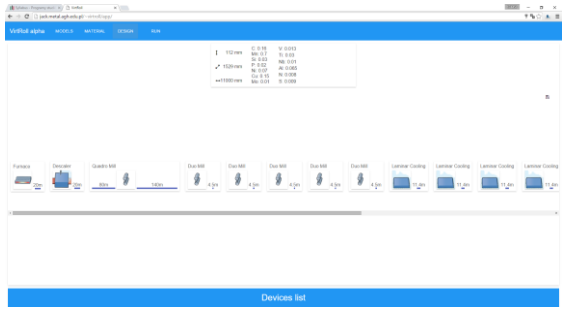

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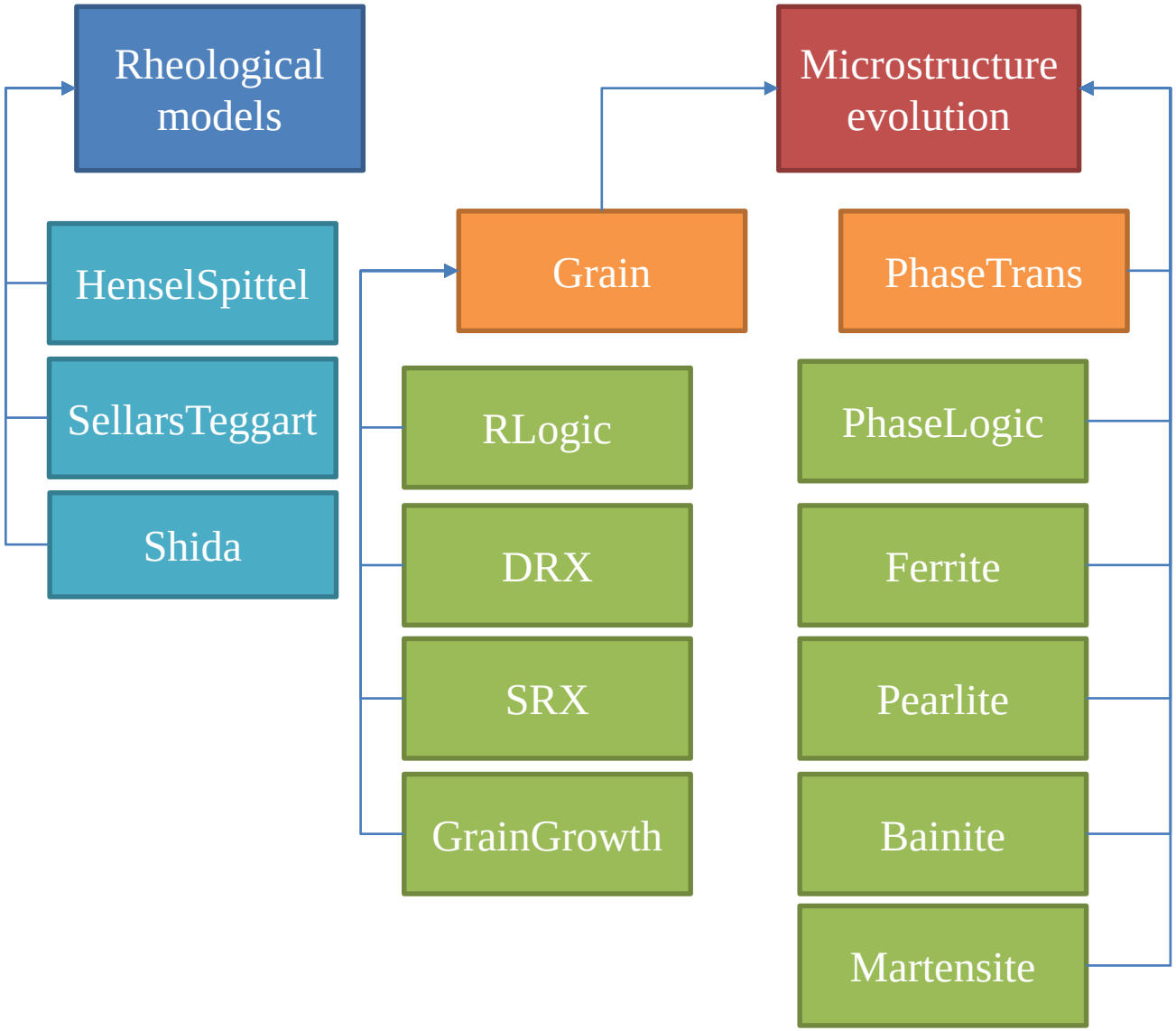
EDA Knowledge Base

Material models

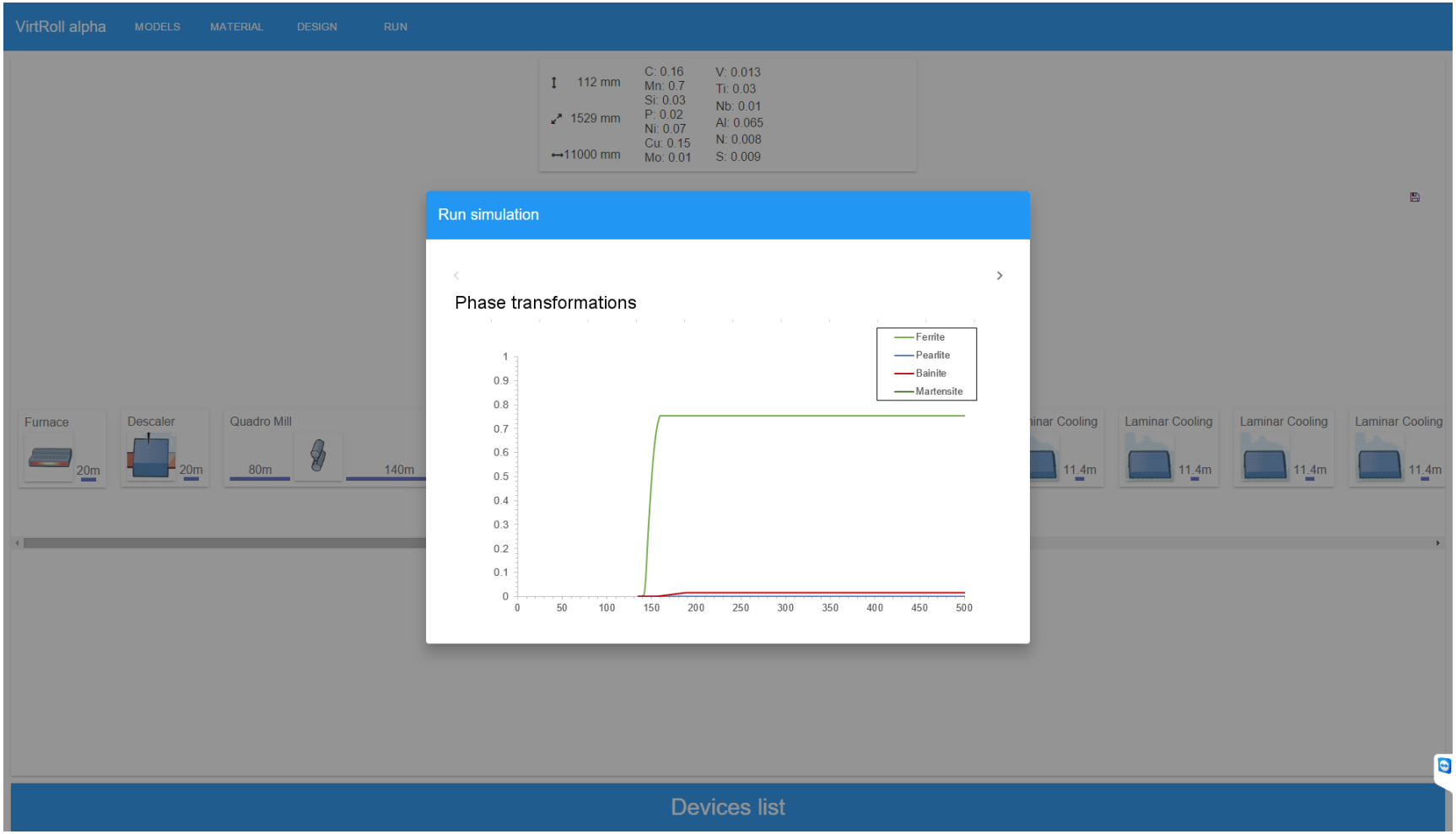


HPC infrastructure

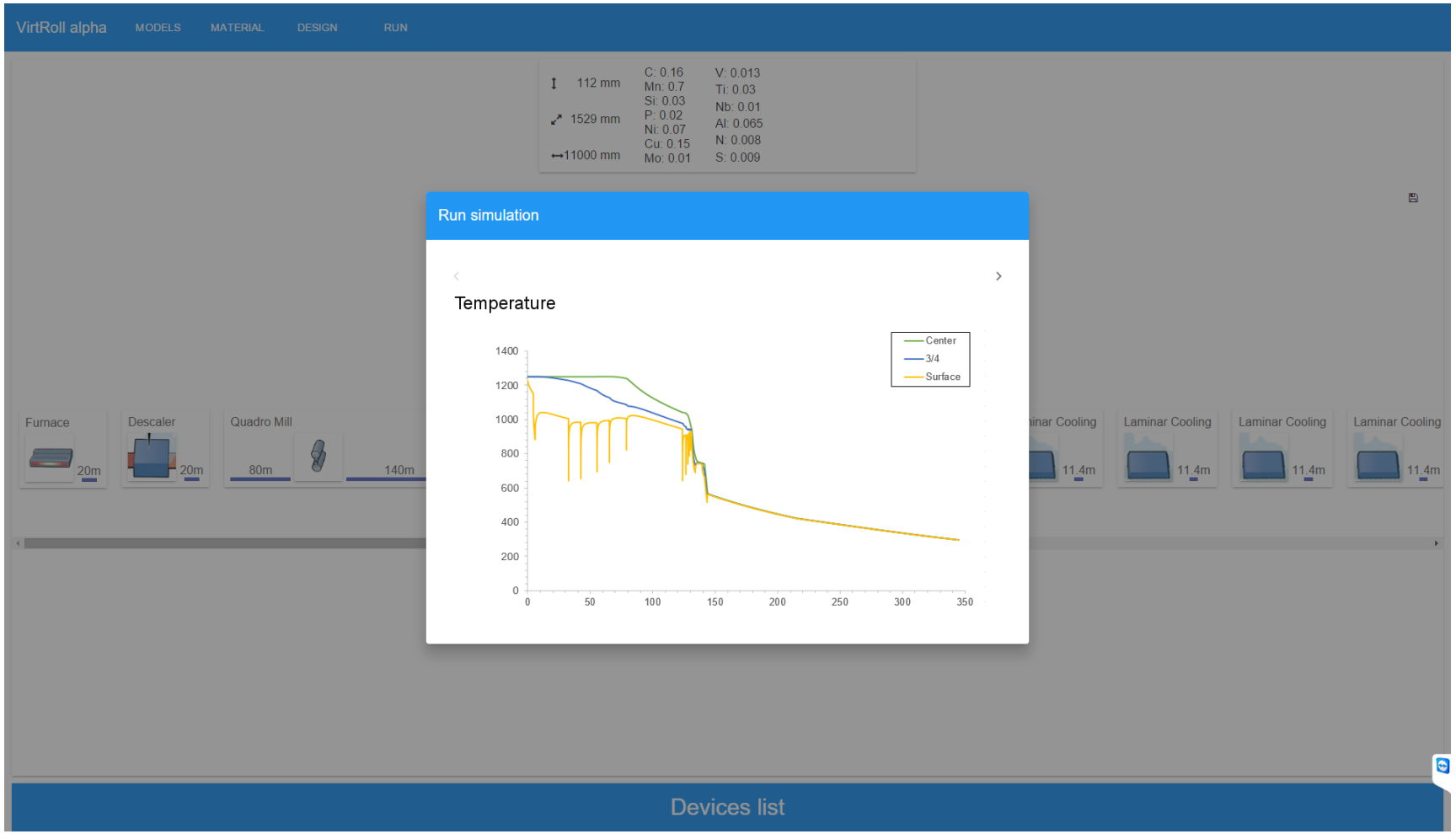
Creation of new model

- Select the class to extend
- Implement new class and its calc method
- Compile the class to obtain *.so (shared object) file
- Upload new model by using web based GUI

Modelling of the rolling process – results



Modelling of the rolling process – results



Conclusions

Issues realized:

- Front-end module with communication layer
- Back-end module with db management and Scalarm communication
- Scalarm integration with sensitivity analysis library
- HPC side computational procedures based on FEM, JMAK and other numerical approaches

Future issues:

- Results are too big – detailed files should be placed on the server, while thinner results should be presented through the web browser
- Optimization library is implemented but it should be integrated with the rest of the code
- Validation of the desing should be implemented on both sides i.e. client and server