

WOSD 2017: optiSLang

recent developments

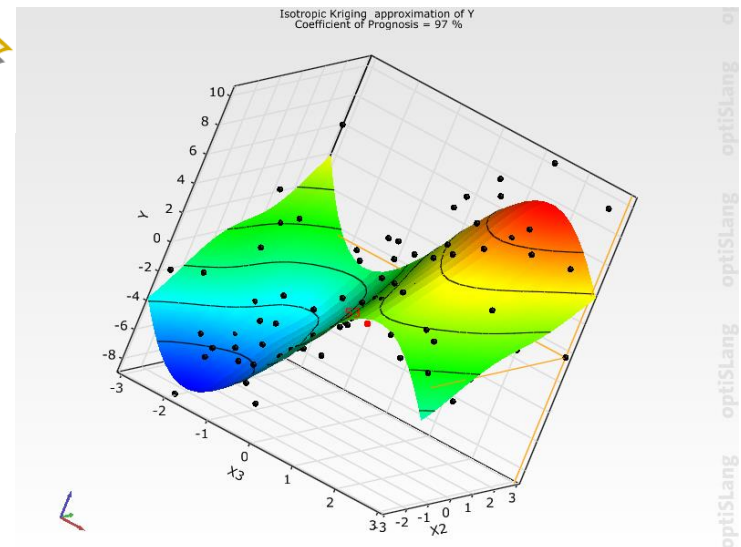
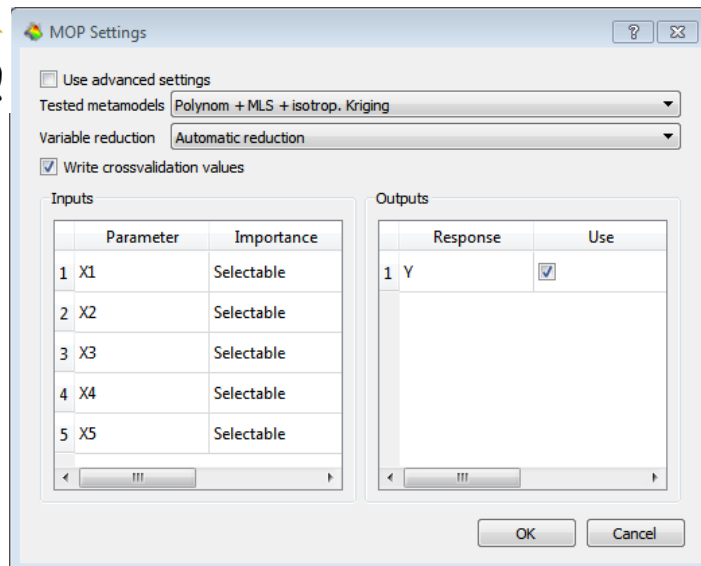
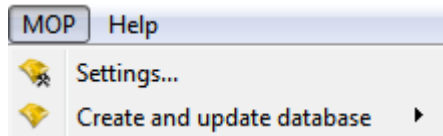
David Schneider
optiSLang product manager

MOP



Create MOP in Postprocessing

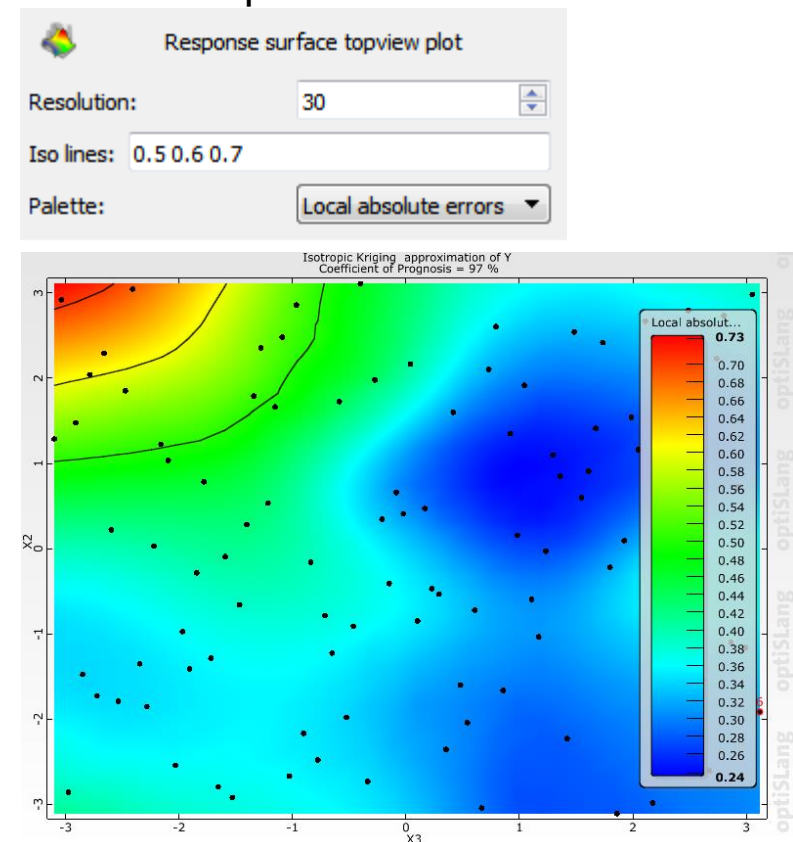
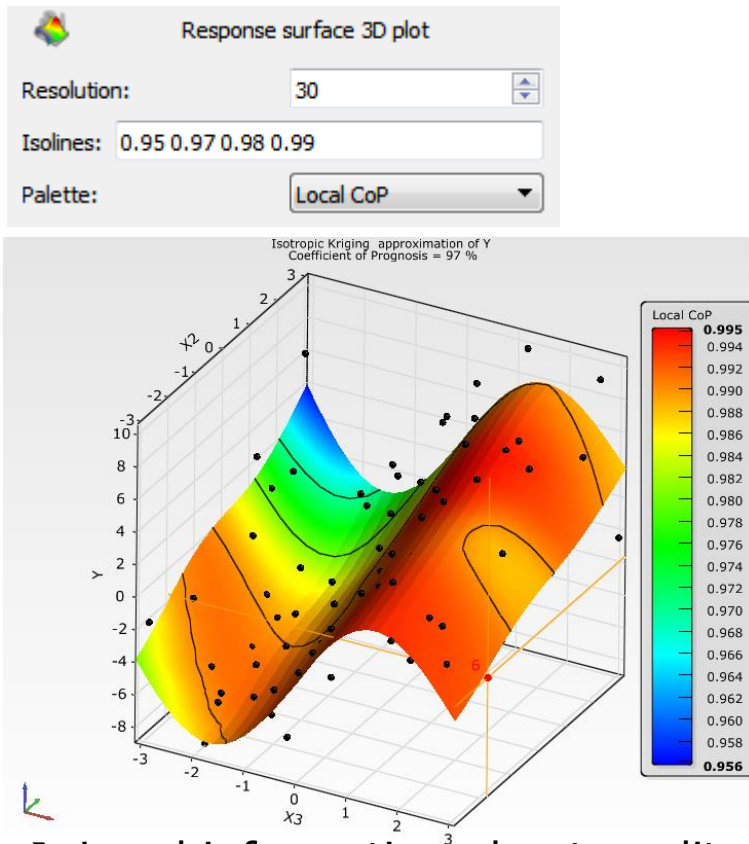
- Directly perform MOP analysis in Postprocessing



➔ More efficient work with optiSLang's powerful data analysis tools

Show local approximation quality

- Estimated approximation error used as color in plots



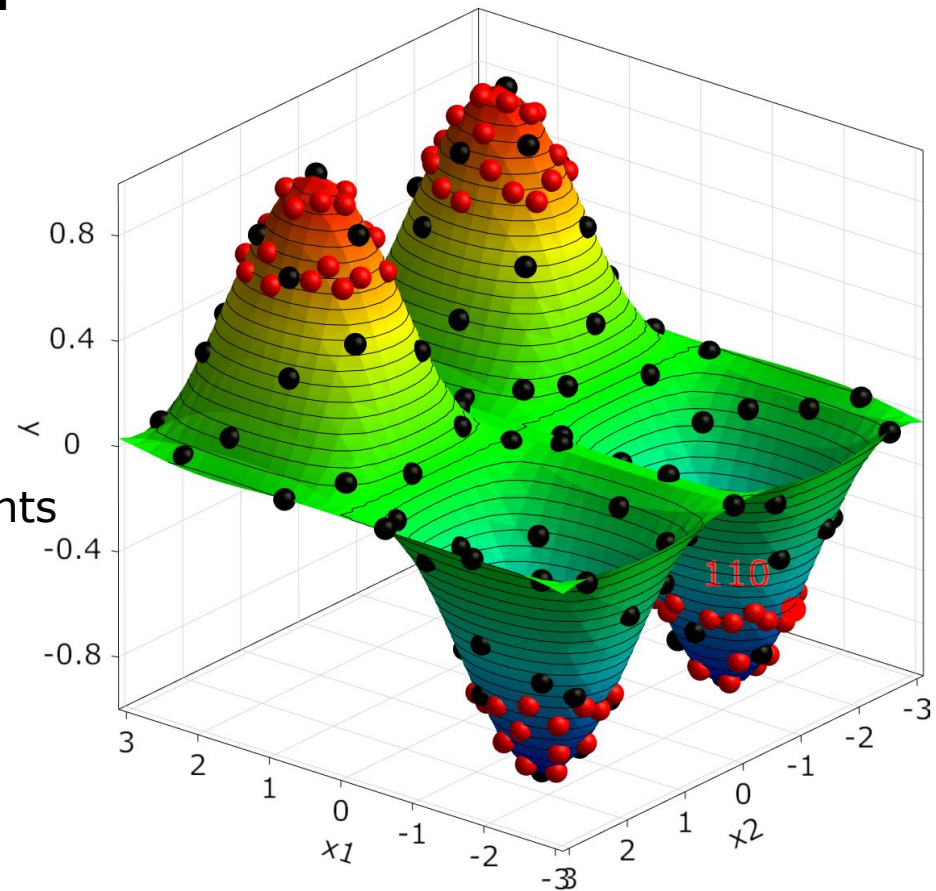
→ Local information about quality available

Adaptive MOP

Iterative adaptation of initial MOP according to user requirements:

- **Global refinement** with advanced and space-filling LHS
- **Local refinement** considering local errors
- **Constraint refinement** considering input/output constraints
- **Single-objective** optimization refinement with constraints
- **Multi-objective** optimization refinement with constraints

AMOP constraint refinement for $\text{abs}(y) > 0.6$

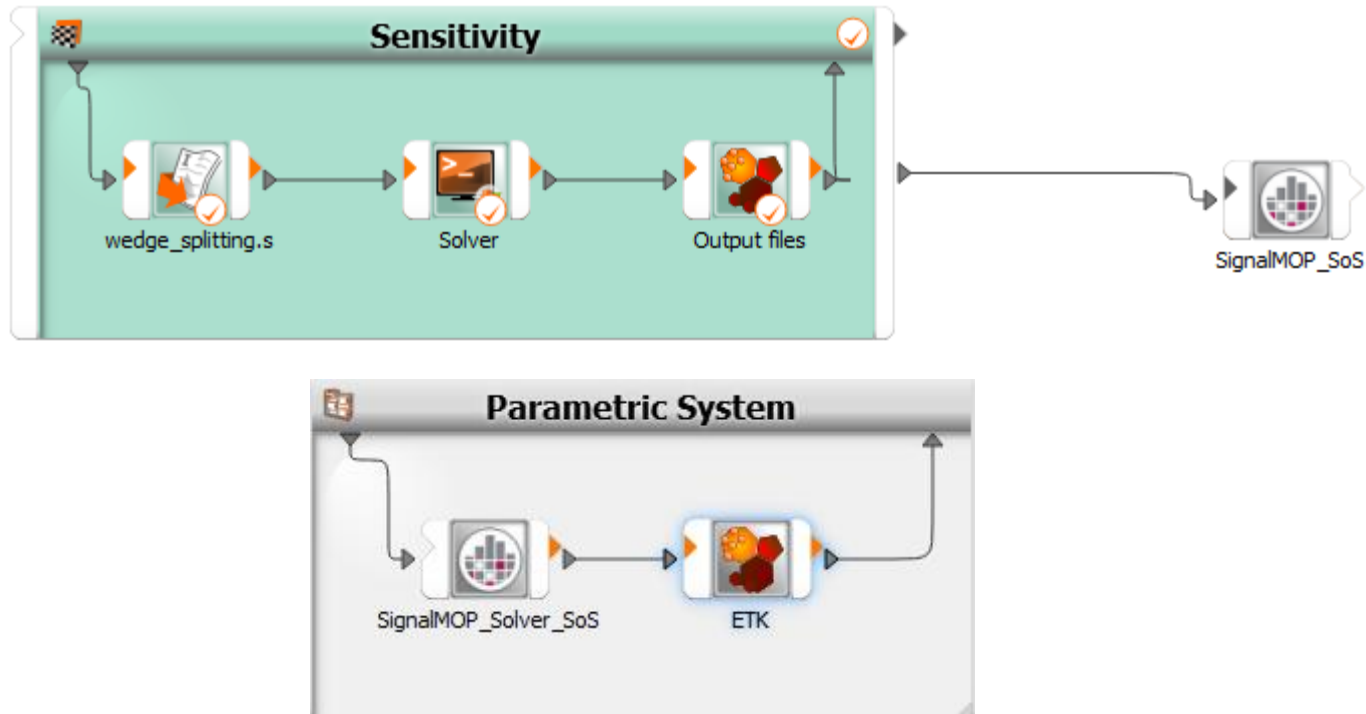


Postprocessing



SignalMOP*

- New integration: SignalMOP & SignalMOPSolver

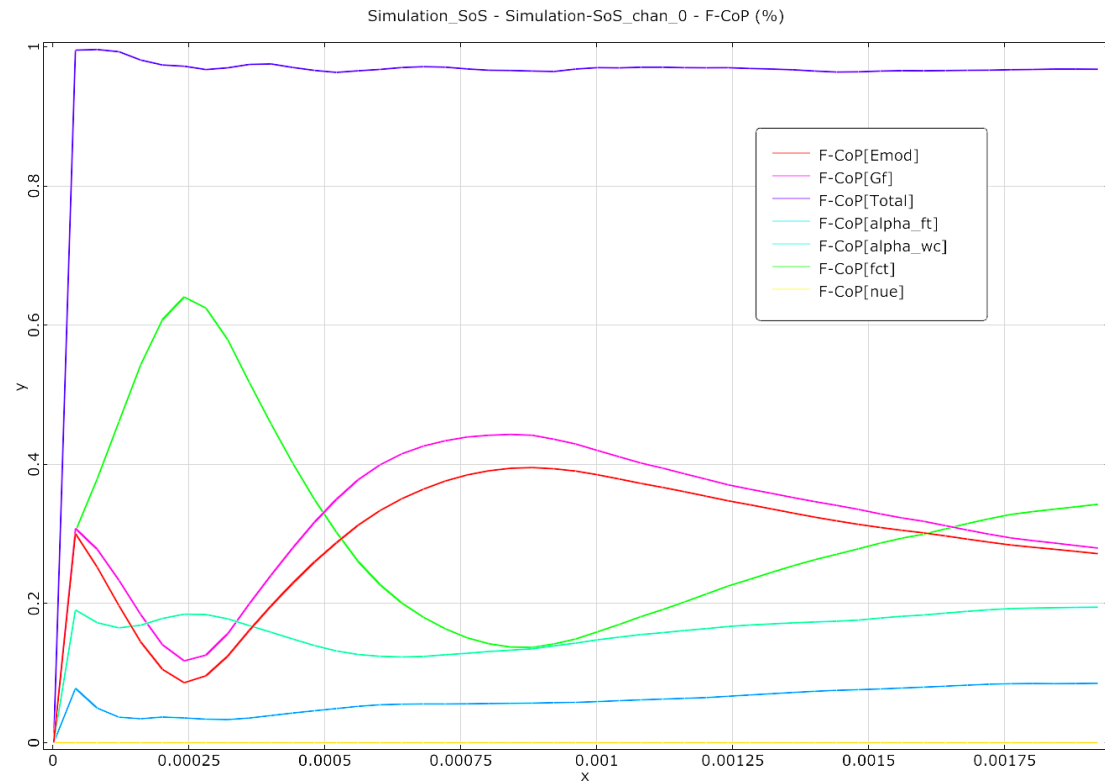
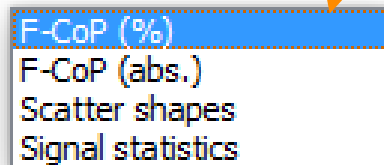
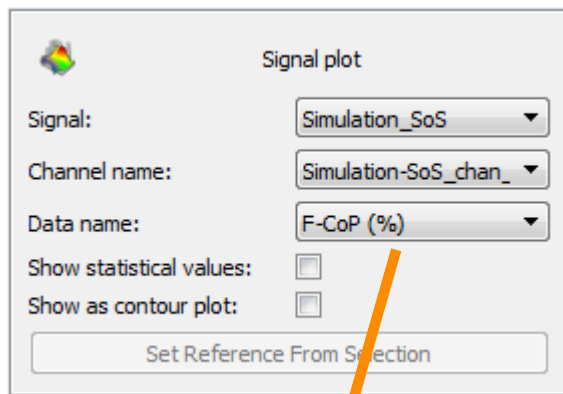


- ➔ Set up a MOP analysis for signals
- ➔ Use Metamodels of Signals (e.g. for calibration)

*Requires SoS, which is not part of ANSYS optiSLang – please contact support@dynardo.de

Show SignalMOP results


- See S-MOP data in built-in plot



➔ All data for postprocessing in one window

Signal statistics

- Contourplot shows “histogram” for signals

 Signal plot

Signal:

Reference signal:

Adjust resolution:

Resolution:

Interpolation type:

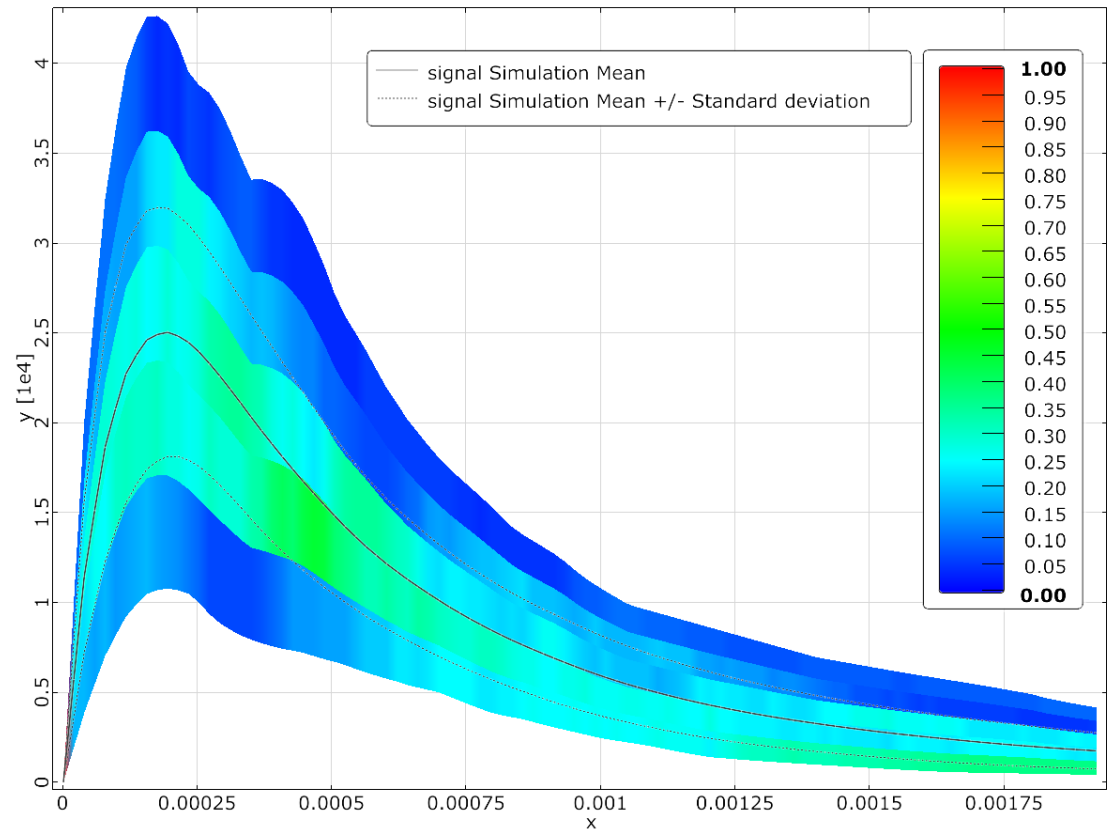
Show statistical values:

Sigma factor:

Show as contour plot:

Number_of_classes:

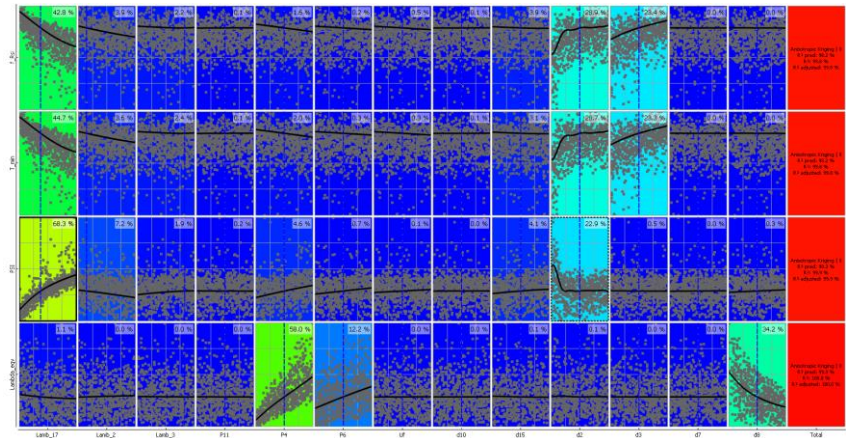
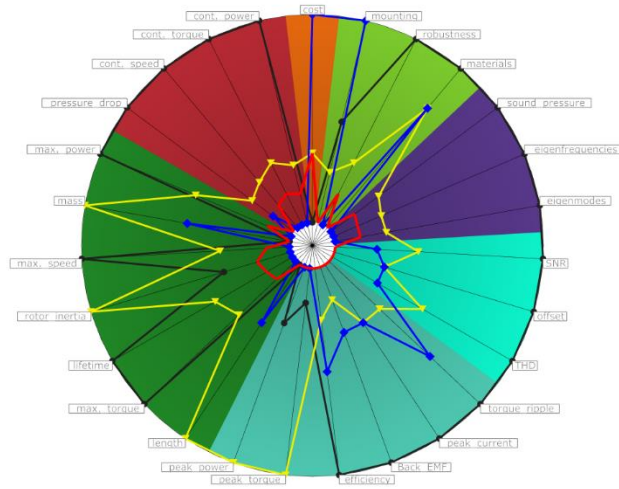
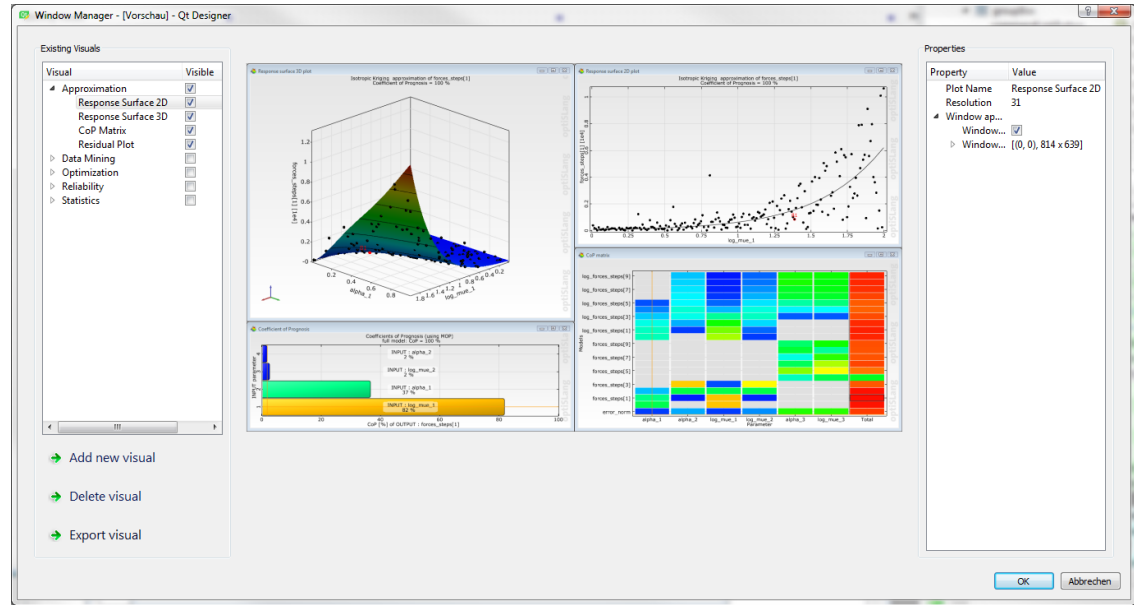
Show palette:



→ Robustness assessment directly on the signal

Outlook

- Radar Chart
- Window manager
- Extended CoP
- Add Criteria
- Save postprocessing
- ...



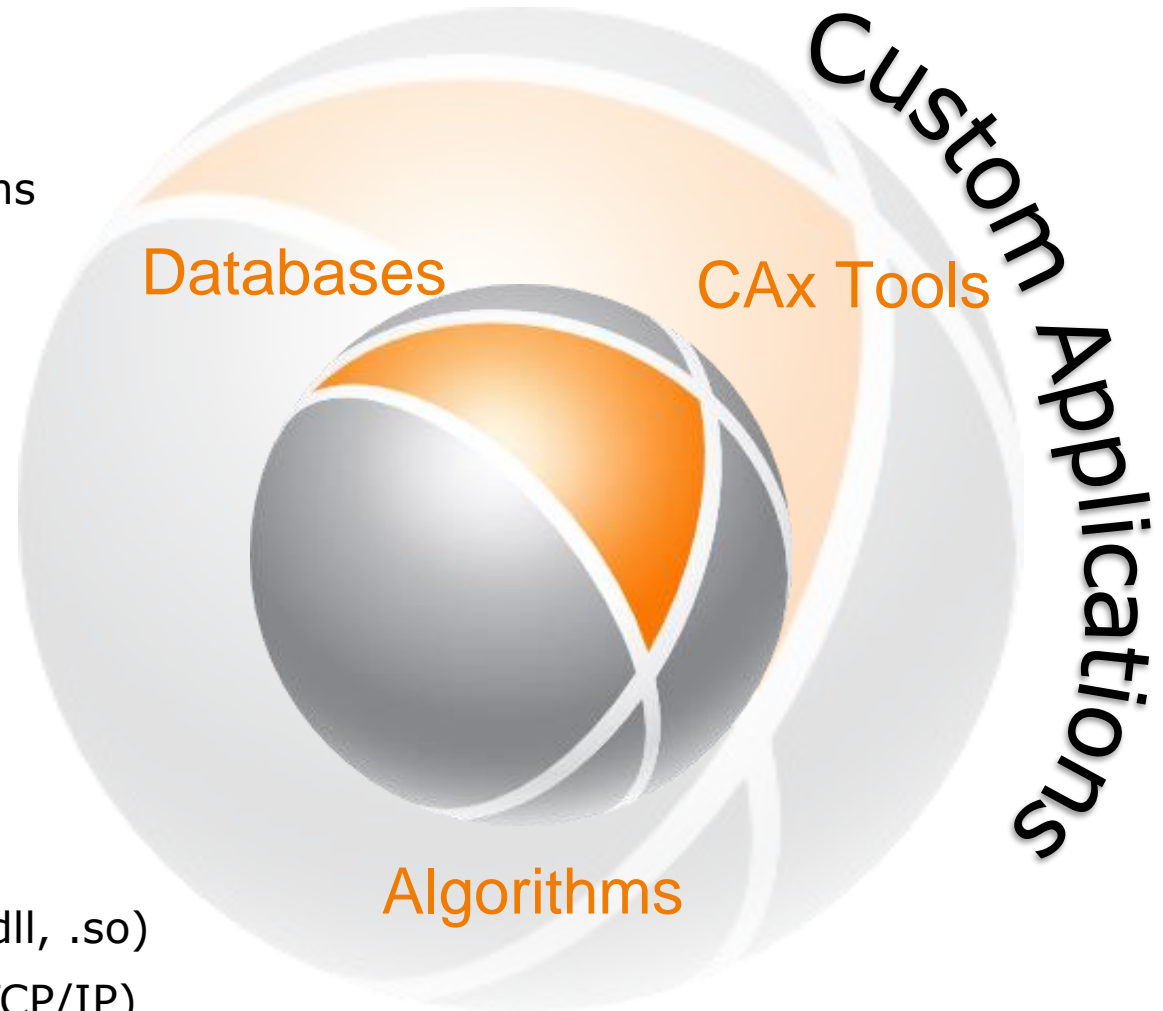
Workflows



Openness – open and programmable architecture

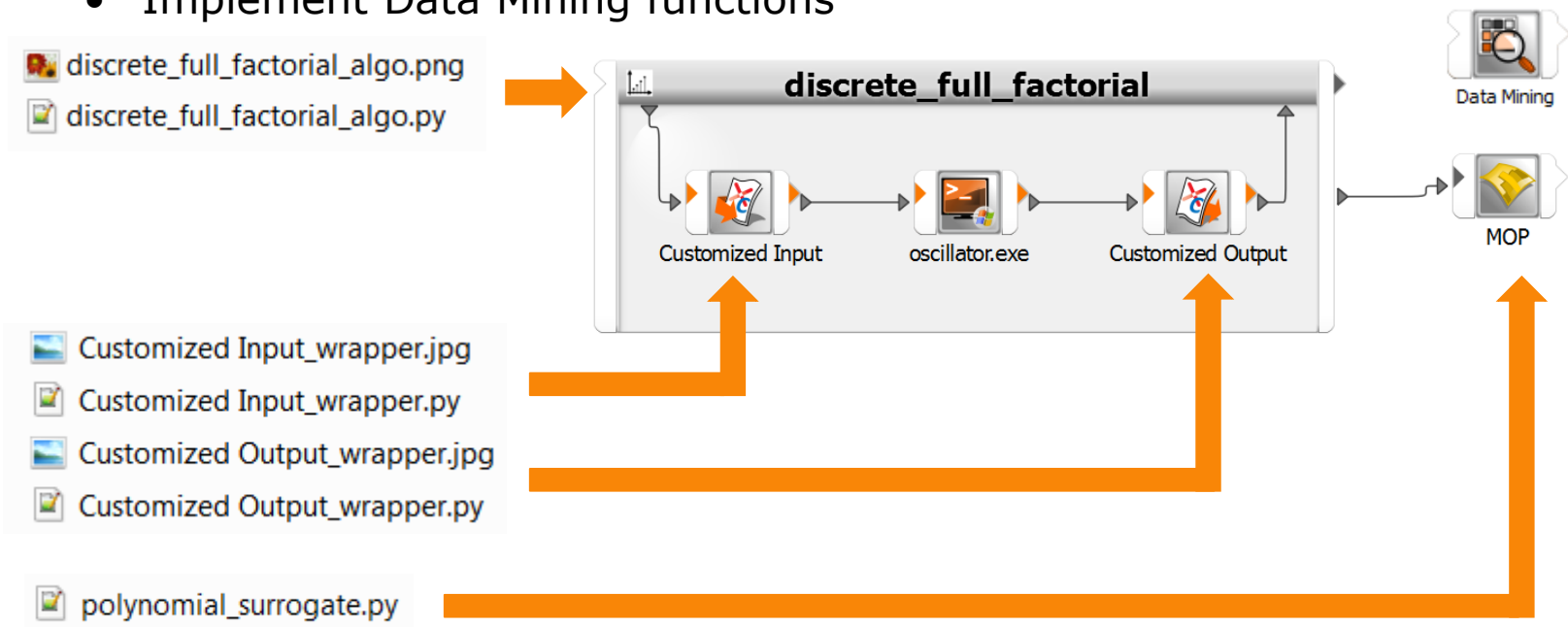
- Plugins
 - CAx Toolintegrations
 - Algorithms
 - (PLM-) Databases

- Interfaces
 - Batch
 - Scriptable (.py)
 - Shared libraries (.dll, .so)
 - Remote control (TCP/IP)



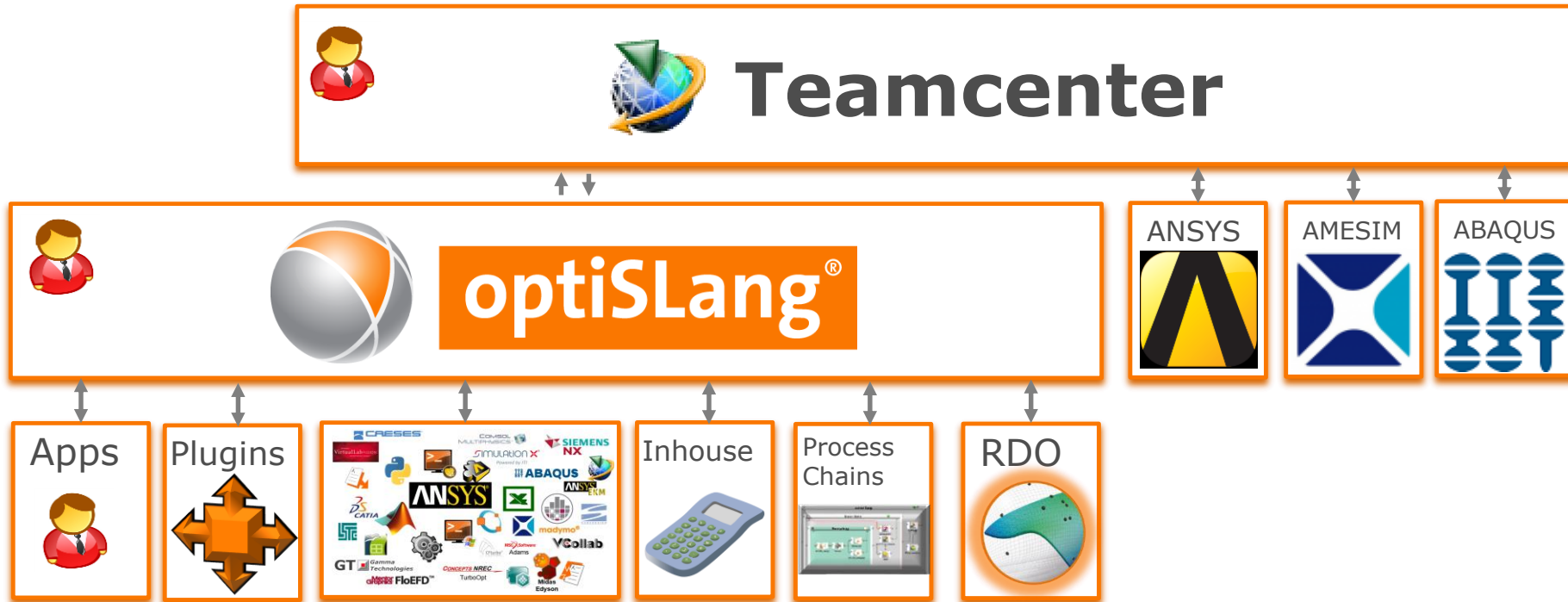
Customization overview

- optiSLang provides plugin mechanisms via Python scripting
 - Define own integration nodes
 - Implement own algorithms
 - Customize Solver Wizard and Postprocessing
 - Extend MOP algorithm with own surrogates (beta)
 - Implement Data Mining functions



optiSLang & Teamcenter for Simulation

- Some standard integrations
- optiSLang for whole CAx-world, workflows,...
- ➔ Most efficient solution (cost, flexibility, time, innovation)





ANSYS® EKM

Process Execution & Data Management



EKM interfacing layer



ANSYS Simulation Platform



Fluids



Structures



Electronics



Semiconductors



Systems



Embedded Software



Multiphysics



Platform

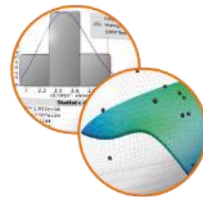
Simulation Workflows



CAx
Automation

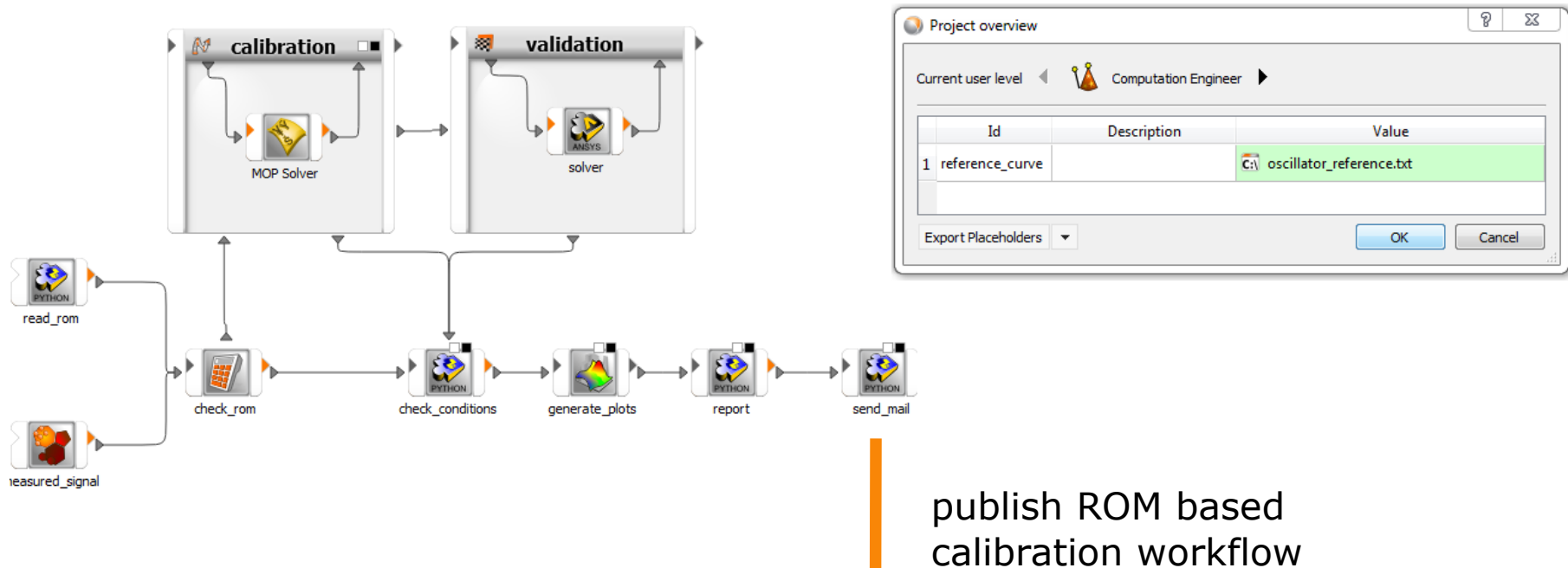


Robust Design
Optimization



Data Analysis &
ROM

Combine different analyses to a complete workflow + publish in EKM



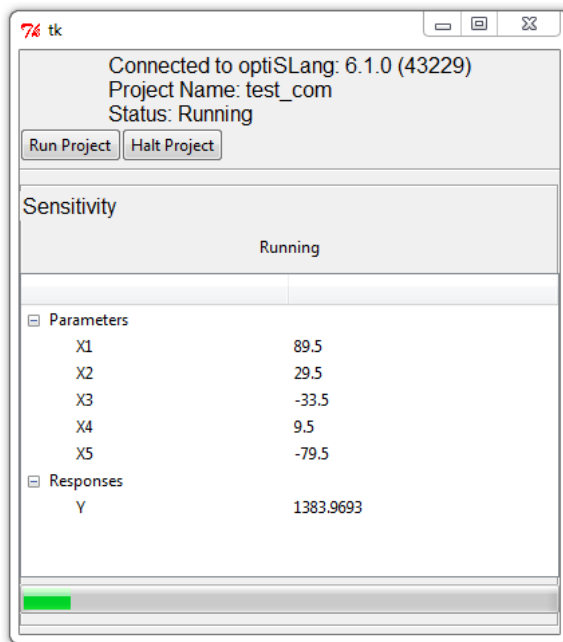
ANSYS

EKM

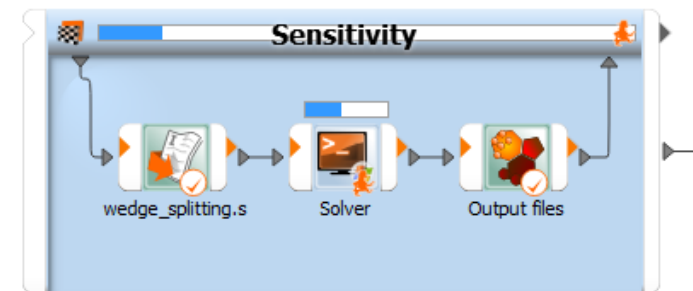
Process Execution & Data Management

Submit & Remote Control with Custom App

- End user can Monitor Status of optiSLang project
- End user can interact with optiSLang project



- via TCP/IP
connect to submitted project
- Get Status
(Project, node...)
- Start/Stop/Reset
(Project, node, single id)



Example: „in-field“ engineer uses digital twin

- ➔ Start EKM in web browser
- ➔ Connect measurement curve to Calibration flow (to identify machine status)
- ➔ Wait for results and monitor progress
- ➔ Identifies machine parameter within **minutes/hours/days**

The screenshot displays the ANSYS EKM web interface, divided into four main sections:

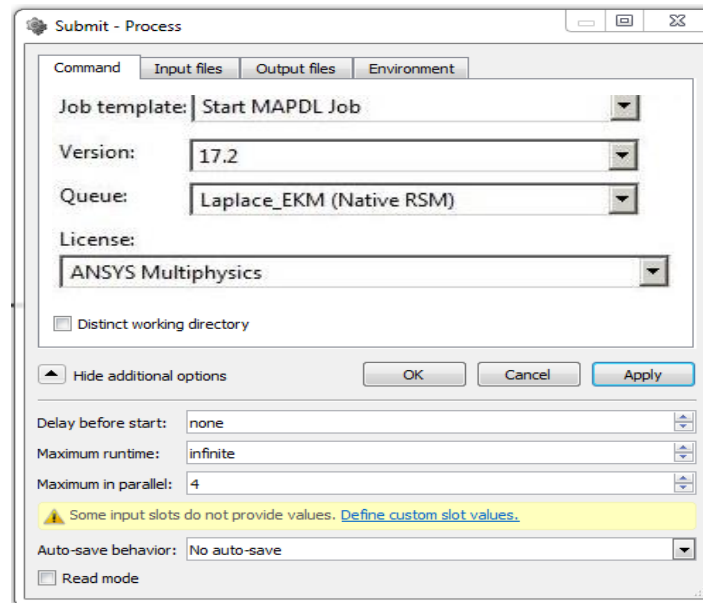
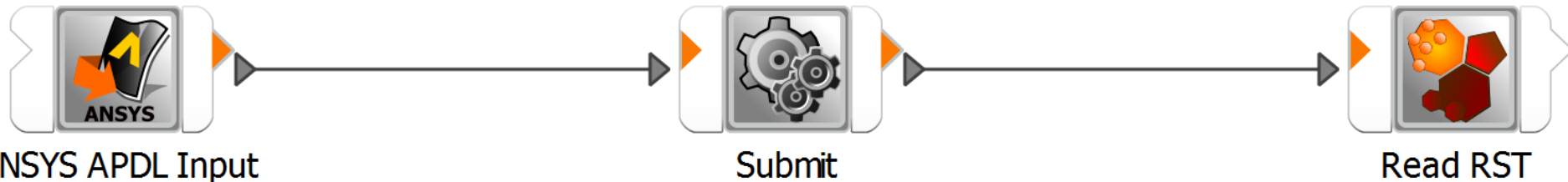
- Dashboard:** Shows navigation options like Home, Dashboard, and My Applications. It features several application tiles: Calibration (highlighted with an orange box), Calibration_uploaded, Clutkieflew, Start CPX Job, and Start Electronics Job.
- Calibrator Node:** Displays a graph of Displacement vs. Time with a green sine wave. Below the graph are input fields for Measured Data, Select Calibrator Type (set to Calibration_RAW), Define Analysis Name (set to Calibrator_arnold2_20), and Define Storage Location.
- Project Summary:** Shows the project status as Running. It includes a progress bar with 12 SUCCEEDED, 0 RUNNING, 8 PENDING, and 0 FAILED evaluations. Below this is an Output Parameter(s) Chart showing a trapezoidal pulse for Diff_freq.
- Design Table:** A table listing design parameters and their values.

ID	Rod_length	Rod_width	Eigen_frequency_1
0.14	28.25	2.225	
0.13	32.75	3.125	
0.12	43.25	4.625	252.390623569
0.11	75.75	4.875	735.038541309
- Machine 12345ab report:** Shows the current state as measurement_0001.txt. It features a graph of Displacement vs. Time with multiple overlapping green sine waves. Below the graph is a table of parameter values with color-coded status indicators.

Parameter	Value	Lower bound	Upper bound
D	5.0130488305548	5.01	5.02
Ekm	1.6474019789	15.0	25.0
k	23.6562623875	20.0	30.0
m	0.0001170000000	0.0	0.0

Outlook: Submit to EKM/RSM

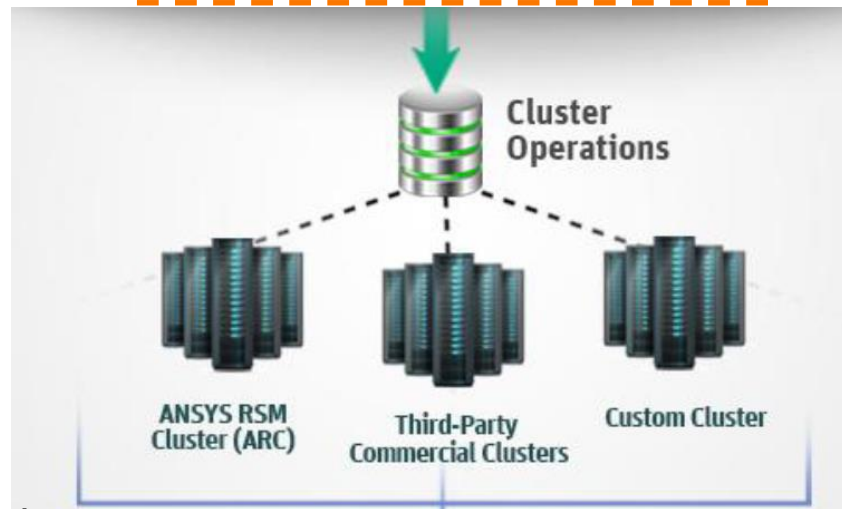
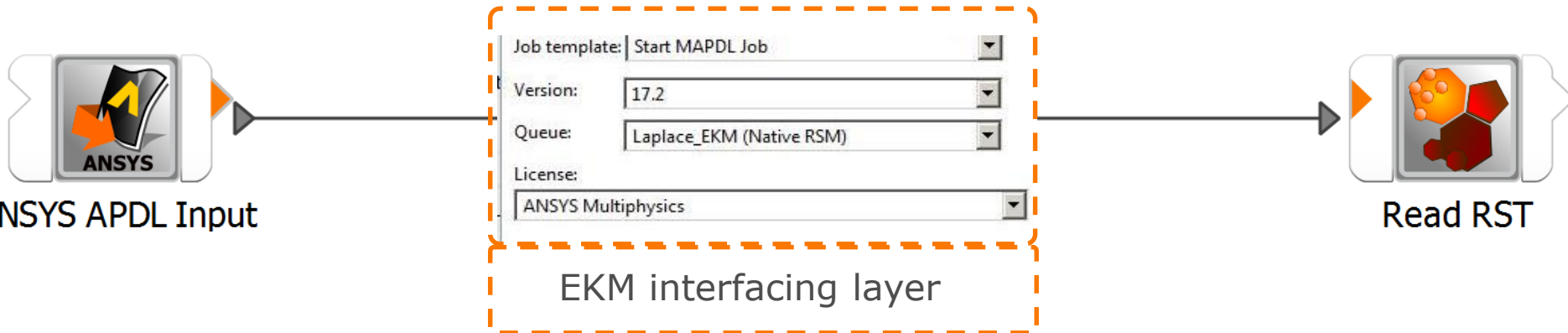
- Submit jobs to ANSYS EKM portal



➔ Built-in HPC solution

Outlook: Submit to EKM/RSM

- Submit jobs to ANSYS EKM portal



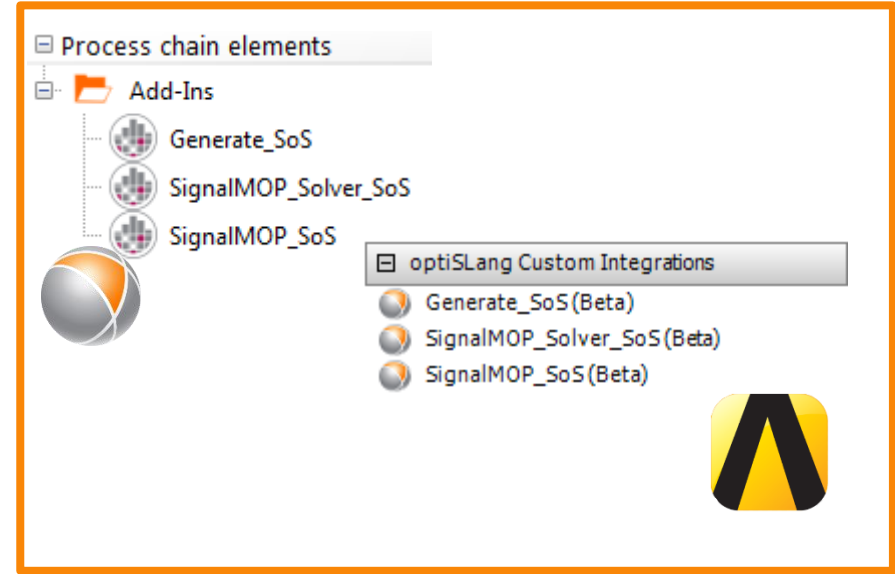
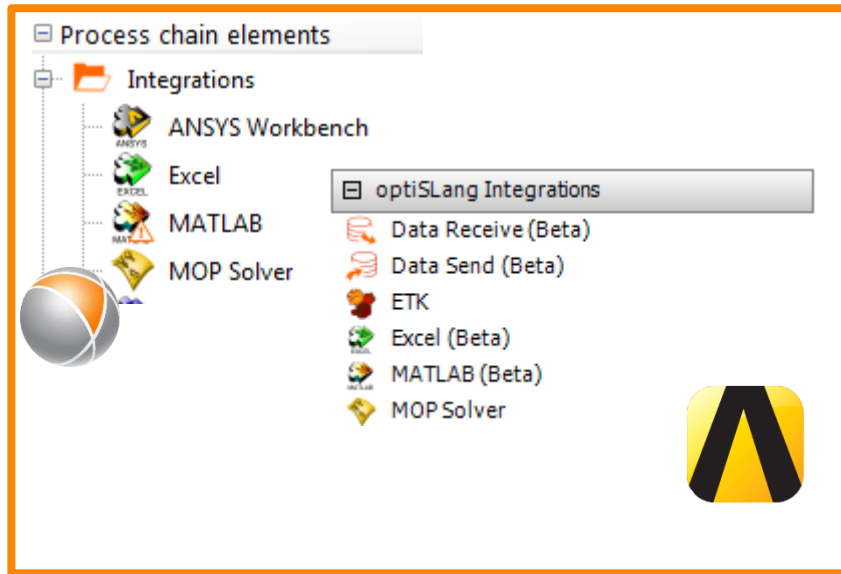
➔ Built-in HPC solution

inside ANSYS



Two new categories inside ANSYS Workbench

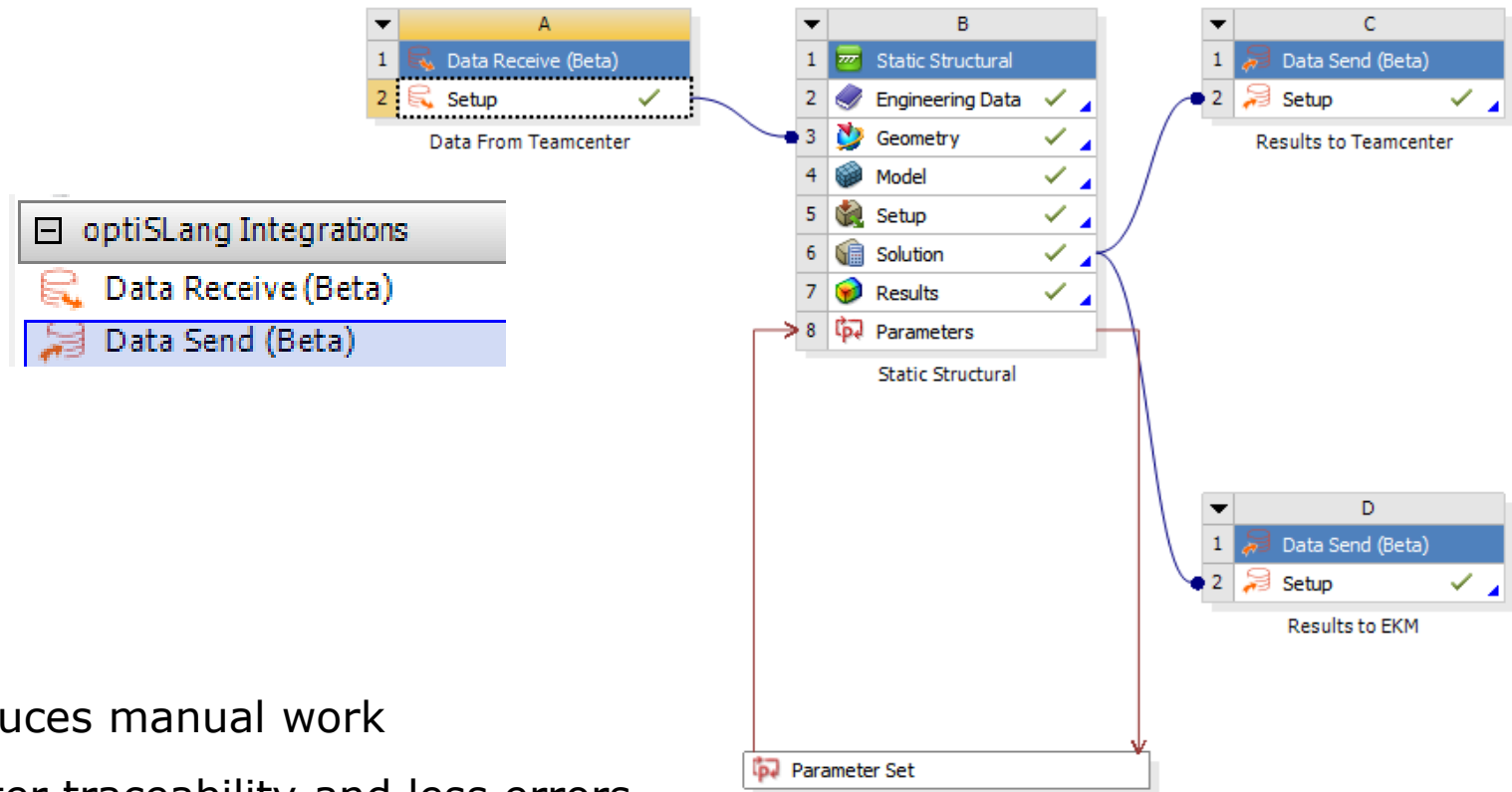
- Use optiSLang integrations directly in ANSYS Workbench



- ➔ Same Look&Feel in optiSLang and Workbench
- ➔ User can stay in Workbench
- ➔ More flexibility in Workflow management

Data Send & Data Receive

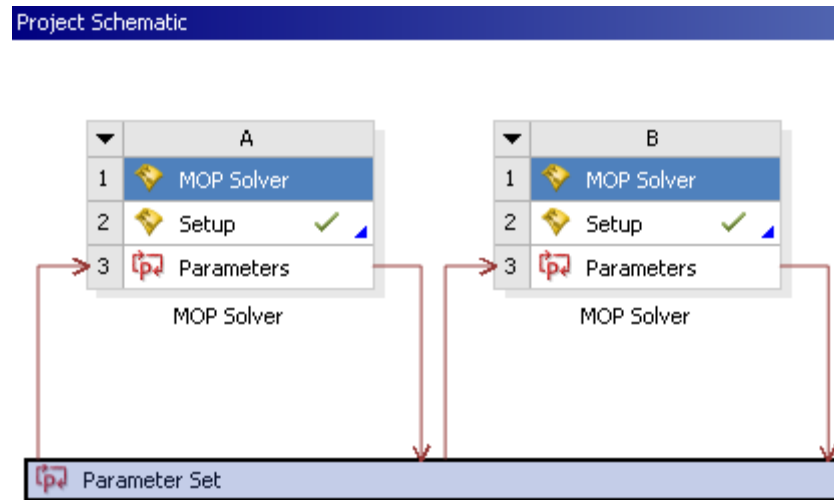
- Beta: Receive Geometries from (PLM-) Databases
- Beta: Send/Archive results in Database



- ➔ Reduces manual work
- ➔ Better traceability and less errors

MOPSolver inside

- Use databased ROM's in Workbench Workflow



- ➔ User can stay in Workbench
- ➔ More flexibility in Workbench schematic

optiSLang's integrations in ANSYS

- Beta: Use optiSLang's Matlab and Excel nodes in Workbench workflow
- Beta: Use custom integrations in Workbench Workflow

The screenshot shows the ANSYS Workbench interface. On the left, a Project Schematic displays a workflow with a 'MATLAB' node connected to a 'Parameter Set' node. The main window shows the MATLAB script editor for 'coupled_function.m'. The script defines a function to minimize a mathematical expression with constraints. Below the script, a table lists the parameters and their values.

Name	Type	Value
i	INTEGER	1
X1	REAL	1
X2	REAL	1
X3	REAL	1
X4	REAL	1
X5	REAL	1
y	REAL	0.5

- ➔ Same Look&Feel in Workbench and optiSLang
- ➔ More flexibility within ANSYS Workbench

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recent developments

David Schneider
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