

INSIDE



OPTISLANG® FOR ANSYS®

A standard introduction of CAE-based Robust Design Optimization (RDO) in virtual product development places high demands on process automation, parametric models and algorithmic efficiency as well as operating reliability. Algorithm wizards and user guidance by best practice modular workflows make optiSLang version 4 an easy and flexible to use software tool for RDO projects.

State-of-the-art algorithms

For the last 10 year, optiSLang has been established as a multi-purpose toolbox for CAE-based RDO. The software enables the user to conduct a sensitivity analysis, optimization or robustness evaluation and is capable of dealing with large numbers of variables using any nonlinear CAE-solver. With the innovative technology of the Metamodel of Optimal Prognosis (MoP) and improved algorithms, challenging RDO tasks can now be efficiently solved.

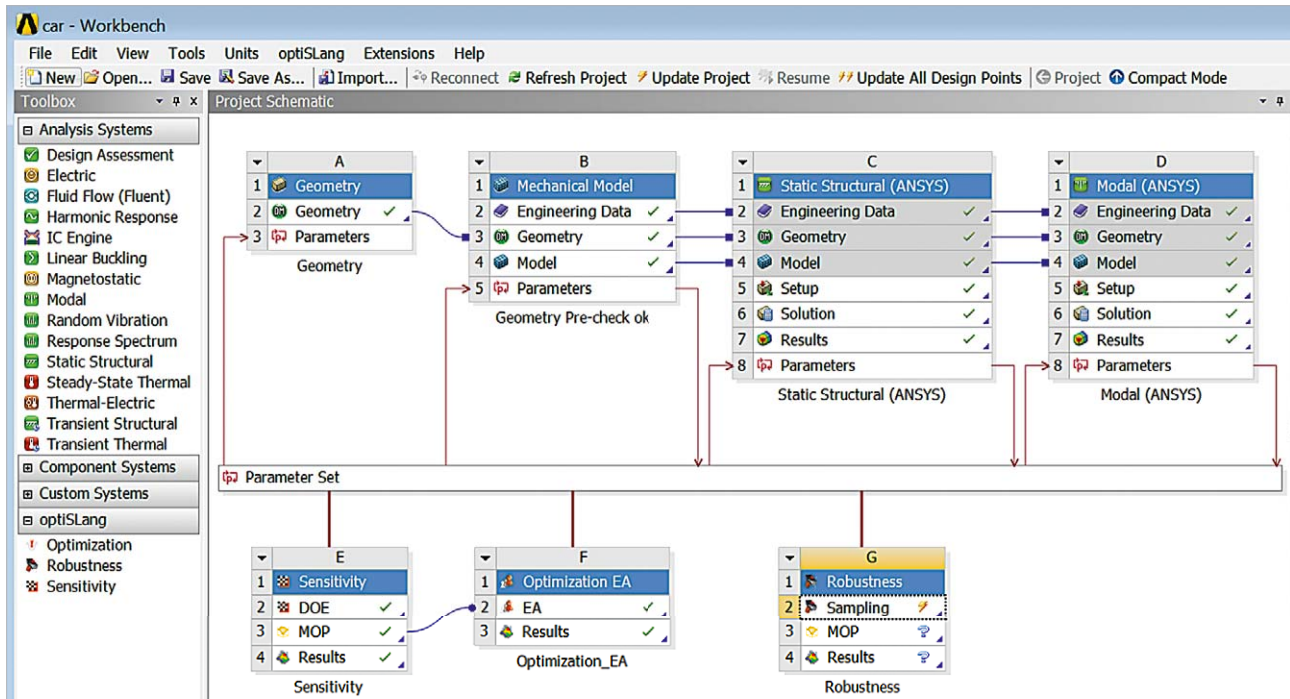
Process integration and automation

To secure the availability and generation of suitable CAE parametric models as a key requirement of RDO, ANSYS Workbench has been established as one of the most powerful parametric modeling environments including bidirectional interfaces to major CAD programs and being capable of collecting all available CAE and CAD data in a central parameter manager. Consequently, the system integration, process automation and job control were also integrated into ANSYS Workbench to update one or multiple designs from the parameter manager. In this context, a direct integration of optiSLang into parametric modeling environments was developed with the same priority as the integration of external CAE-codes into optiSLang's process automation functionality. To reach this goal, optiSLang was recoded from scratch

and all optiSLang functionality was designed using C++ code with related interfaces which can be used by optiSLang's GUI the same way as inside third party modeling environments. This concept was implemented in optiSLang v 4 inside ANSYS Workbench, released in 2011. The stand-alone optiSLang GUI v 4 was released In 2012 providing enhanced functionalities in process integration and automation. The new graphical user interface supports the file based process integration, the direct access to parametric modeling CAE environments like ANSYS or SimulationX, as well as to programming environments like EXCEL, MATLAB or Phyton. If all parameters are available in the ANSYS Workbench parameter manager, optiSLang inside ANSYS Workbench is the best integration mode. If input or output parameters have to be added, RDO tasks should be solved with the integration of ANSYS Workbench projects into optiSLang and the extension of parameter and process workflows using optiSLang process integration functionality. For integration of ANSYS Workbench projects, the integration node as well as the file base communication via optiPlug functionality is available.

Best practice modules

To achieve a regular, daily use of RDO methodology using tools like optiSLang, the software has to provide best practice algorithms with available defaults and wizard



ANSYS Workbench project page showing the three optiSLang drag and drop modules used to define and RDO application using sensitivity analysis, followed by optimization and robustness evaluation

guidance. Furthermore, optiSLang provides three modular modules for best practice RDO algorithms and workflows:

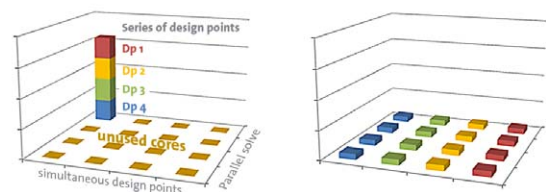
1. **sensitivity analysis** to understand the design, to reduce parameter to the most important ones, to check forecast quality of response variation and to automatically generate the best possible meta model
2. **optimization** to improve design performance
3. **robustness evaluation** to check design robustness exposed to scattering material parameter, production tolerances or scattering environmental conditions

Using optiSLang inside ANSYS Workbench, the 3 modules can be applied with drag and drop functionality. With these modules, the user input is reduced to an absolute minimum amount, which is the setting of parameter ranges, scatter, constraints and objectives. All algorithm settings are generated with best practice defaults and a wizard guided modular workflow. Within the optimization modules, algorithms are available choosing the most efficient and fitting optimization strategy on the basis of the sensitivity analysis and user input.

More efficiency by ANSYS HPC support

If one design evaluation needs a significant amount of time to be solved, two ways of speeding up the process are available. First, with ANSYS HPC functionality where every design update can be executed by using multiple cores. Second, for simultaneous execution of multiple designs, parametric pack licenses (from v14.5) are available. Here, necessary

licenses for updating a design point are multiplied. Thus, user can appropriately distribute jobs across the available compute resources. For example: 4 HPC Parametric Pack Licenses allow for 32 design points to run simultaneously and one additional HPC Parametric Pack License for 64 design points. These techniques enable different systematic approaches using remote compute resources. It is not only possible to run the solution process (the solver) remote, but also other parts of the process chain, like result extraction, can be run on the remote server, which is especially useful for large data sets.



Left: update of 4 design points using one ANSYS License and a Hardware containing 16 cores. Right: update of 4 design points using one ANSYS License + 1 HPC Pack + 1 HPC Parametric pack to solve 4 design points using 4 cores each at the same time. Theoretically update can be executed 64 times faster

Product bundle “optiSLang for ANSYS”

To provide our users full access to optiSLang’s functionality within one license, we offer the product bundle “optiSLang for ANSYS” containing optiSLang inside ANSYS Workbench, optiPlug and optiSLang stand-alone including ANSYS Workbench integration node. For distribution and support, we are glad to work together with the CADFEM GmbH as our long term ANSYS partner.