

# version 4.5 | HIGHLIGHTS



## EXPERIENCE THE ADVANTAGES OF THE NEW RELEASE

Simplified user experience, new run analysis dashboard and improved RSM functionalities: **version 4.5** introduces new essential features and enhancements aimed at increasing engineering productivity and shortening the design cycle.

### EXPLOIT AN EASIER USER INTERFACE

Project handling is now more intuitive with enhanced GUI usability.

- New Palette Menu
- Drag&Drop Workflow building
- New Parameter Chooser
- Multiple windows with one license
- Enhanced Explorer Tree
- New compact Tool Bar and Menu

### CONTROL YOUR OPTIMIZATION PROCESS

Smart monitoring gadgets of the new Run Analysis Dashboard help you get the most out of real-time data.

- Live charts with easy filtering
- View real-time design images
- Direct access to logs
- Engine task manager

### GET ONE STEP CLOSER TO REAL WORLD

Enhanced accuracy and decision support increase confidence in design solutions.

- Added RSM Validation
- New RSM algorithms
- Improved MORDO Tool
- Percentile computation for 6-Sigma
- Renewed MCDM algorithms
- Simple wizard-based MCDM interface

### STREAMLINE COMPLEX WORKFLOWS

Refactored architecture enables assembling and reuse of modular and nested multidisciplinary projects.

- Sub-Process Node
- Scheduling Project Node





## INTEGRATION AND PROCESS AUTOMATION

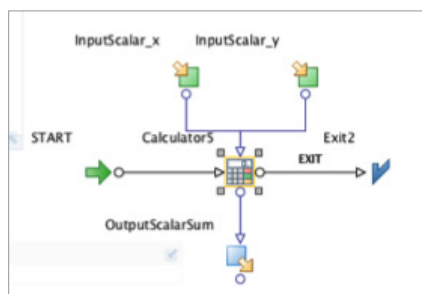
### INTEGRATION NODES UPGRADED

The architecture of Integration Nodes has been reviewed to improve usability and new capabilities have been added:

- The *Parameter Chooser* is the new node editor with automatic I/O parameter detection, enabling faster and guided workflow building. It helps manage workflow components and includes: automatic links and new node creation, the Find and Filter functions and the possibility to link more than one input node to the same parameter.
- The new *Test Configuration* option enables the validation of basic CAE node functionalities like software version and local / remote execution management.

### NEW SUB-PROCESS NODE

The *Sub-Process Node* introduces powerful new capabilities for the effective management of complex workflows. It can autonomously execute processes - independent workflows able to map data input to data output, over-passing the optimization task.

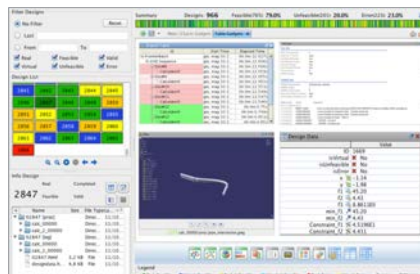


The Sub-Process Node enables users to nest processes, built with the dedicated processMODELER tool, into modeFRONTIER projects. Complex problems are converted into a breakdown of its constituent parts: modeFRONTIER workflows become modular and re-usable, natively support loop process execution and allow users to create well-organized multi-disciplinary projects.

### NEW RUN ANALYSIS ENVIRONMENT

A flexible and customizable dashboard, enriched with intelligent graphic tools, allows real-time monitoring of the design evaluation progress. The wide range of gadgets available (tables, charts and logs, to name a few) are

automatically updated as the optimization advances, providing useful insights into process performance. Hence, real-time adjustments to the optimization strategy are enabled, leading to significant project improvements.



### MORE THAN TWO WINDOWS AT A TIME

The new capabilities of modeFRONTIER 4.5 to handle sub-processes and multiple scheduling tasks demands the editing of many workflows at a time. The 'Open in New Window' feature allows users to open any number of cloned windows without needing additional licenses.

“The new Run Analysis ensures **total control** over the design optimization process, making rapid **real-time** adjustments possible.”



## DESIGN SPACE EXPLORATION

### RSM VALIDATION PROCEDURE

Designers are able to make the most of modeFRONTIER® metamodeling capabilities with very little manual effort. The new RSM Validation enables users to train multiple response surfaces for the same output (or even for different output at the same time) and obtain an accurate ranking of their quality. Sophisticated validation statistics return several meaningful indices for each RSM (such as mean absolute error, mean relative error and R-Squared error or the Akaike Information Criterion).

### RECTANGULAR CORRELATION MATRIX

The *Rectangular Correlation Matrix Chart* allows users to perform intuitive correlation analysis. Different variables can be plotted respectively on the X and Y axes, focusing only on the significant relationships for a better understanding of design space structure.



## OPTIMIZATION

### FINE-TUNED HYBRID ALGORITHMS

Discover the advantages of using modeFRONTIER® fine-tuned hybrid algorithms.

**FAST** | accelerates the process by exploiting RSM performance over the region of most interest in the Design Space, attaining high-speed detection of the optimal solutions.

**HYBRID** | automatically combines the robustness of Genetic Algorithms with the accuracy of Gradient methods providing an unprecedented balance between exploration and refinement capabilities.

**SanGeA** | provides an automatic screening phase coupled with a GA global search phase, reliably identifying the most meaningful variables to face high-dimension and unconstrained problems.

### RSM TOOL

The SS-ANOVA and DACE-Kriging algorithms have been added and algorithm performance has been enhanced to improve the capability of building highly reliable response surfaces.

### SCHEDULING PROJECT NODE

The *Scheduling Project Node* is a new component of the workflow further improving automatic exploration and optimization of the search space. It enables the execution of *Optimization Projects*, modular projects defining the optimization strategy (i.e. DOE, Scheduler, and goals - objectives and constraints). Engineers can now combine and automate multiple design exploration and optimization tasks, set up nested or hierarchical optimizations to simplify design problems by imposing a hierarchical decomposition of the search space, resulting in guided and effective execution of complex chains of problems.

### NEW SCREENING METHODS IN MOGT

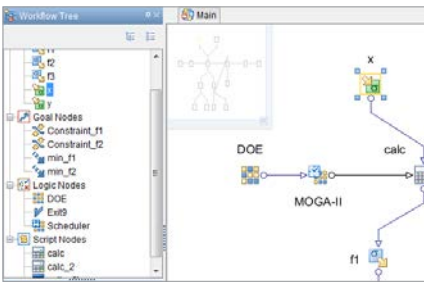
The SS-ANOVA and Random Method have been added to the *T-Student* test as screening methods available as parameters of the MOGT algorithm. Users can now adjust this parameter according to their knowledge of correlation among input variables and objectives values. Thanks to the three methods, MOGT is more effective in addressing the different importance of variables and maximizing their contribution to the objectives.

## WHAT'S NEW

ANALYTICS AND  
VISUALIZATION

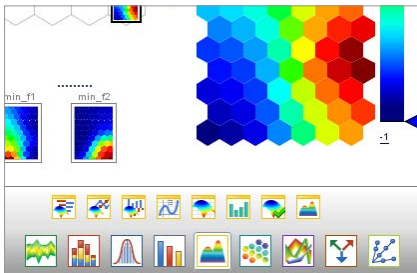
## ENHANCED EXPLORER TREE

The enhanced *Explorer Tree* makes it easy to navigate when dealing with projects containing hundreds of nodes in the Workflow and hundreds of charts in the Design Space.



## DRAG&amp;DROP PALETTE

Workflow building, chart creation or run-gadget insertion is now easier with the *Palette* - the new GUI component that substitutes the *Buttons Bar* and *Buttons Panel*. The Palette has several functions that give immediate access to desired elements: drag&drop gestures, customization for showing/hiding elements, favorite category, and Search function are some of the new features.



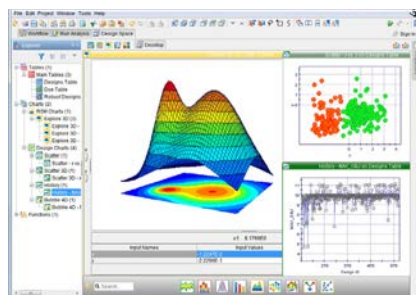
## NEW CHARTS ADDED

The *RSM Validation Chart*, visualizing the results of the Validation step and helping select the suitable RSM comparing indices and validation tables.

ROBUST DESIGN  
AND RELIABILITY

## MORDO IMPROVED CAPABILITIES

MORDO, the modeFRONTIER tool for Multi-Objective Robust Design Optimization, now offers enhanced capabilities of handling uncertainties related to real world problems.



MORDO now includes the Percentile calculation which can be added to the Robust Design Table and used to evaluate reliability associated to certain output variables. By linking Percentile to objectives and constraints, design uncertainties related to operative conditions is handled and failure probability minimized.

“The highly efficient GUI and the new Parameter Chooser of modeFRONTIER 4.5 have **cut down** the time required for workflow building **by half**.”

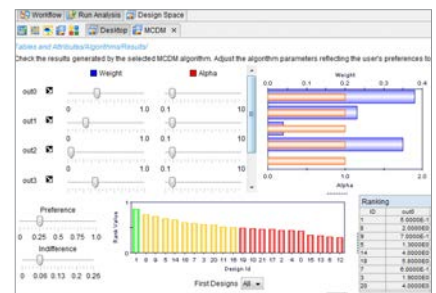


## DECISION MAKING

NEW MULTI CRITERIA DECISION  
MAKING (MCDM) TOOL

The MCDM tool has been completely re-written; the wizard-based solution now enables the execution of interactive decision making.

Starting from a design table with many optimized designs or an already calculated MCDM function, the Decision Maker can easily extract good designs by adjusting the weights and criteria characterizing the design problem and generate a complete ranking of the best class of designs. The design ranking is updated in real-time to reflect the Decision Maker's settings and completed by color-coded qualitative bar charts.



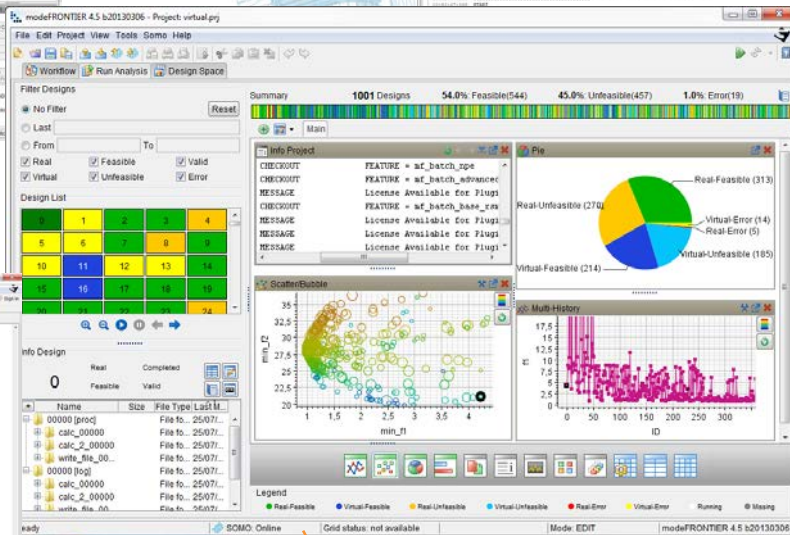
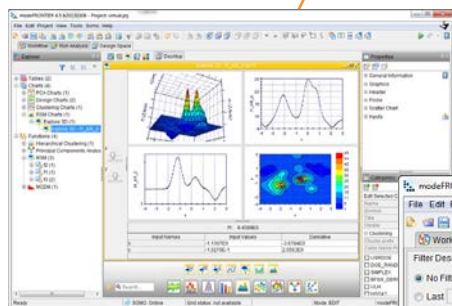
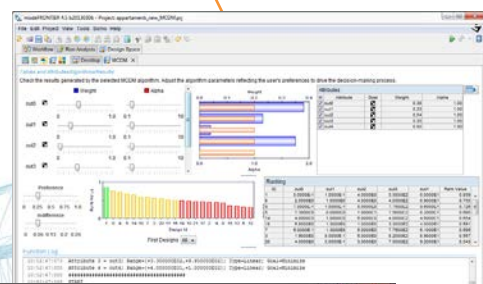
Users can now adopt five different techniques to rank the designs: 4 algorithms have been completely re-written and improved (i.e. Linear, GA, Hurwicz, Savage) and the brand new AHP algorithm has been added. With the Analytic Hierarchy Process algorithm users define the importance of each attribute and the algorithm automatically calculates all pairwise comparisons.



## OS X VERSION NOW AVAILABLE!

modeFRONTIER 4.5 is available to Mac users. The Mac version includes all the features present in the Linux version.





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