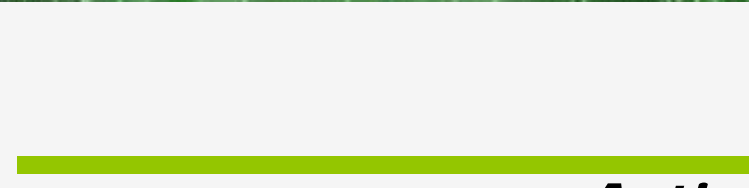


ANSYS Workbench & eArtius Optimization



Agenda

- Basic Features of eArtius Plug-in
- Interaction of ANSYS Workbench with eArtius Plug-in
- Interaction of eArtius Local Plug-in with eArtius Console Optimization Modules
- Interaction of eArtius Remote Plug-in with eArtius Pareto Explorer standalone application
- Getting Started
- Intevac Use Case

Basic Features of eArtius Plug-in

ex2 - Workbench

File View Tools Units Help

New Open... Save Save As... Import... Reconnect Refresh Project Update Project Update All Design Points Project

Toolbox

- Component Systems
- eArtius Optimization
- Engineering Data
- External Connection
- Geometry
- Microsoft Office Excel

Project Schematic

A

- 1 Microsoft Office Excel
- 2 Analysis
- 3 Parameters

Microsoft Office Excel

Parameter Set

B

- 1 eArtius Optimization
- 2 Optimization Model
- 3 Optimization Algorithm
- 4 Optimization Result

eArtius

Properties: No data

	A	B
1	Property	Value

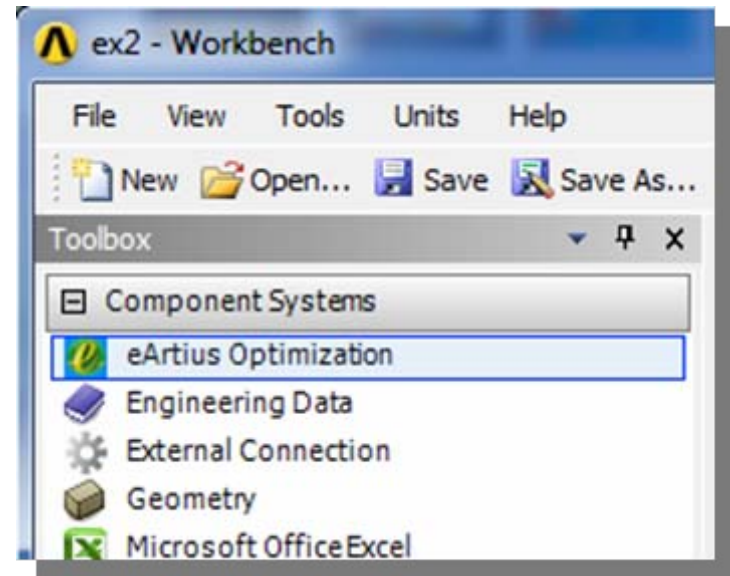
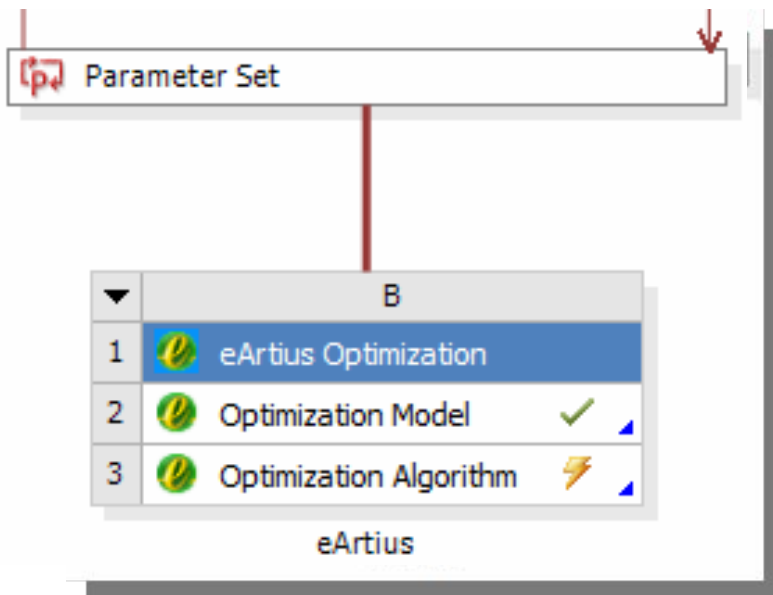
Messages

	A	B	C	D
1	Type	Text	..	Date/Time
2	Informational	Custom RSS feed could not be accessed. http://www.ansys.com/irss/ansys-news.rss		11.02.2012 16:35:30

Ready

Show Progress Hide 1 Messages

eArtius Optimization component is now available among Workbench Components



Choosing an eArtius Optimization Algorithm

The screenshot displays the eArtius software interface. On the left, the 'Project Schematic' window shows a 'Parameter Set' connected to a component 'B'. Component 'B' has three sub-components: 'eArtius Optimization', 'Optimization Model', and 'Optimization Algorithm'. The 'Optimization Algorithm' sub-component is highlighted with a lightning bolt icon, indicating it is the active selection point.

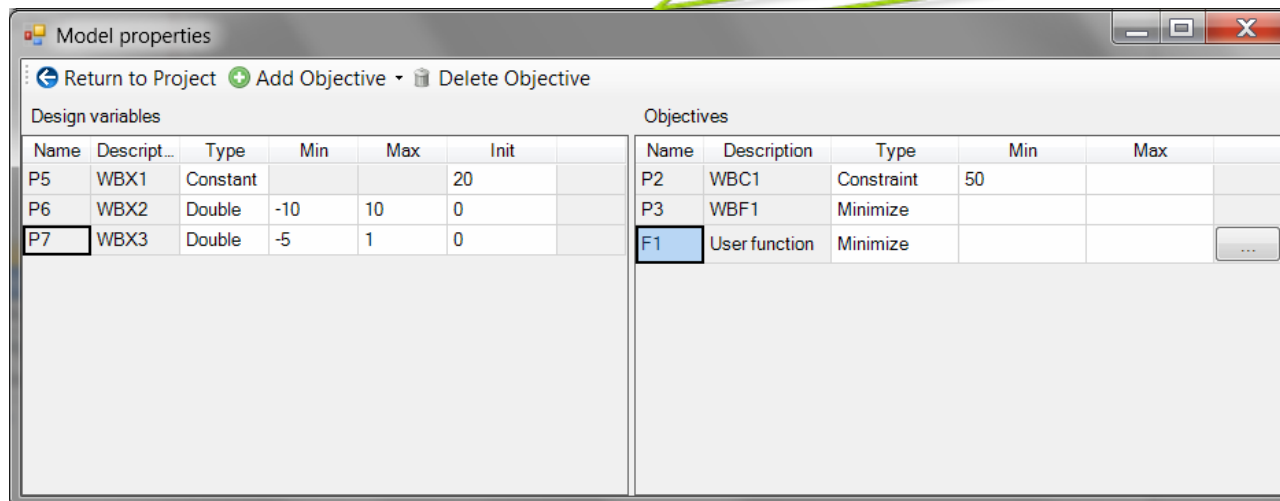
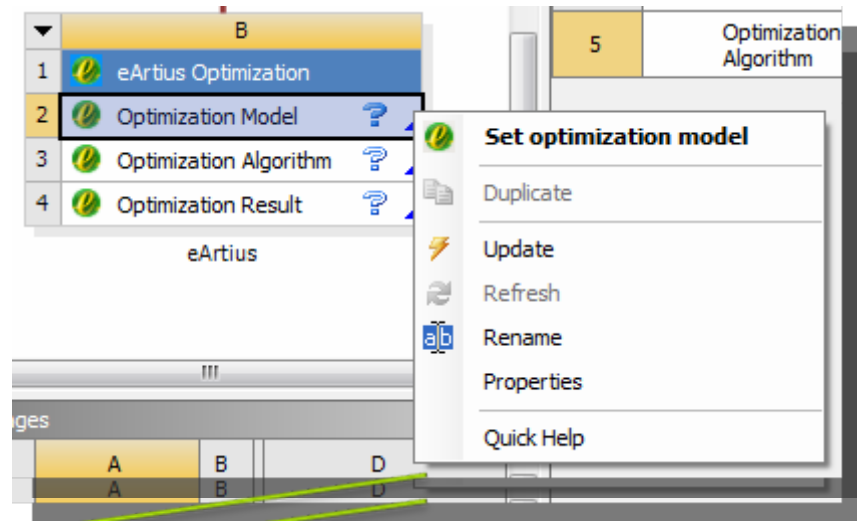
In the center, the 'Properties of Schematic B2: Optimization Model' dialog box is open. It contains a table with two columns, 'A' and 'B', and five rows. The 'Optimization Algorithm' property is highlighted in row 5, and its value is 'HMGE (Local)'. A green arrow points from this dropdown menu to a larger, expanded view of the dropdown list on the right.

	A	B
1	Property	Value
2	General	
3	Component ID	Optimization Model
4	Directory Name	eArtius
5	Optimization Algorithm	HMGE (Local)

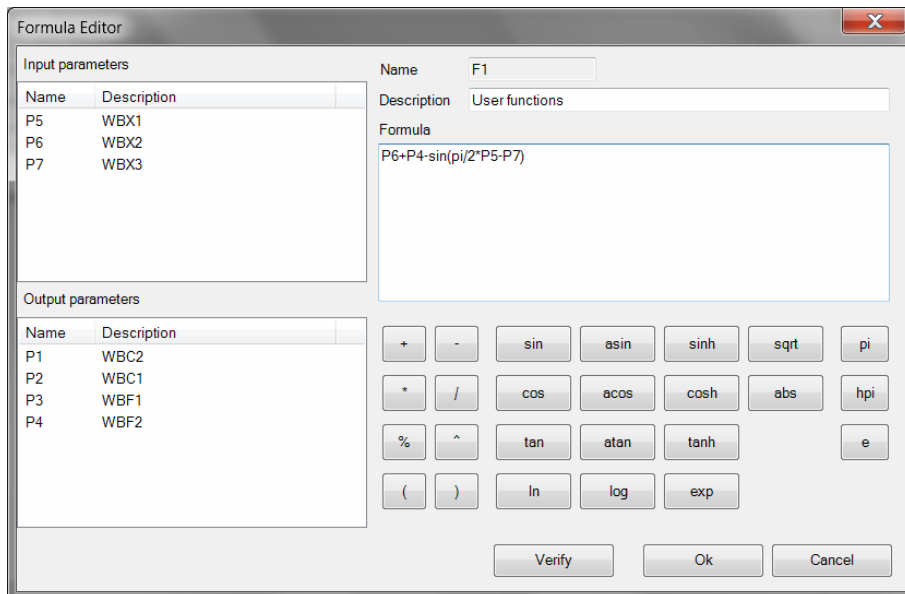
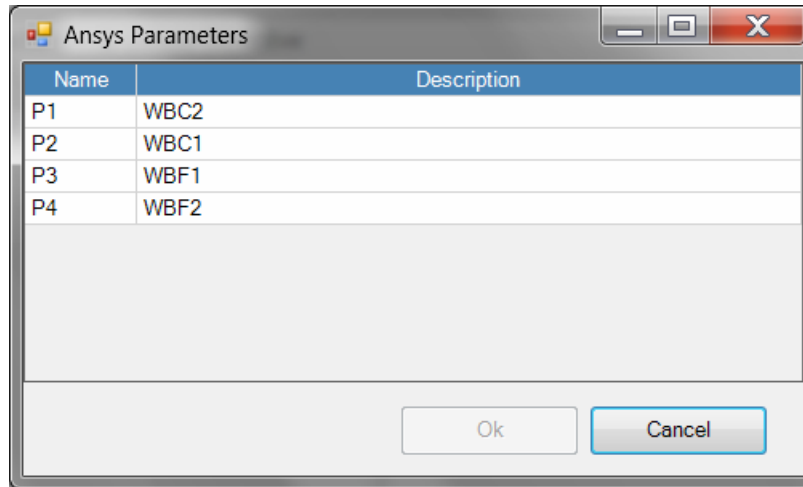
The expanded dropdown list on the right shows the following options:

- MGE (Local)
- MGP (Local)
- HMGE (Local)
- HMGP (Local)
- MGE (Remote)
- MGP (Remote)
- HMGE (Remote)
- HMGP (Remote)

Setting up an optimization model properties

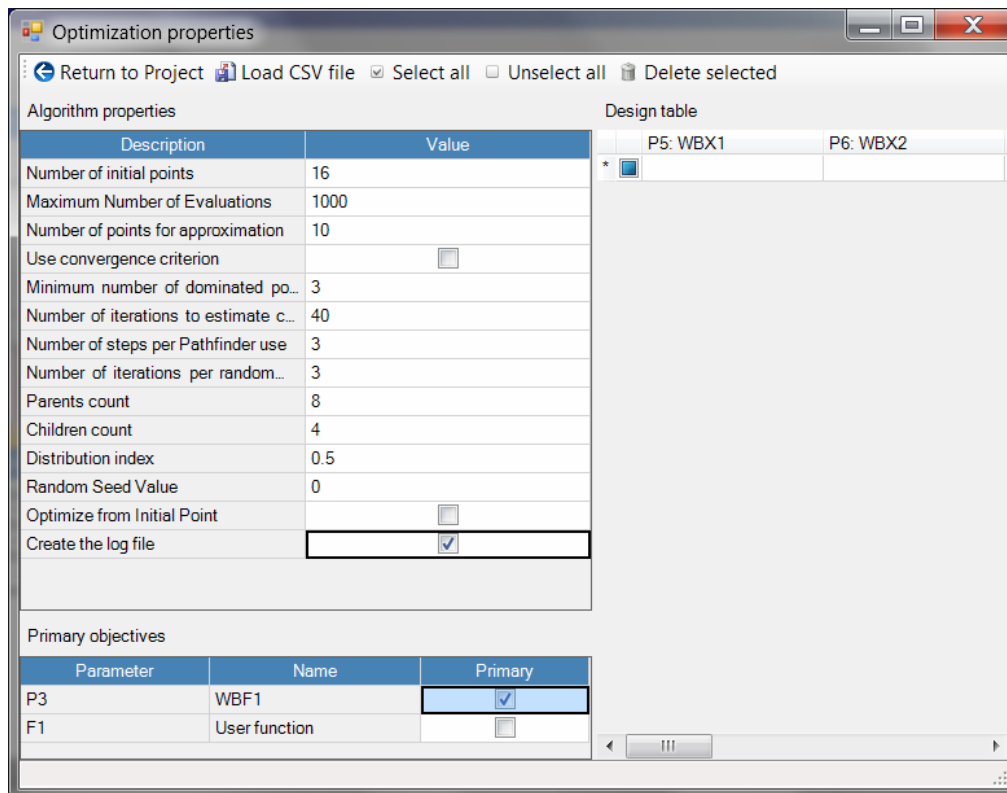
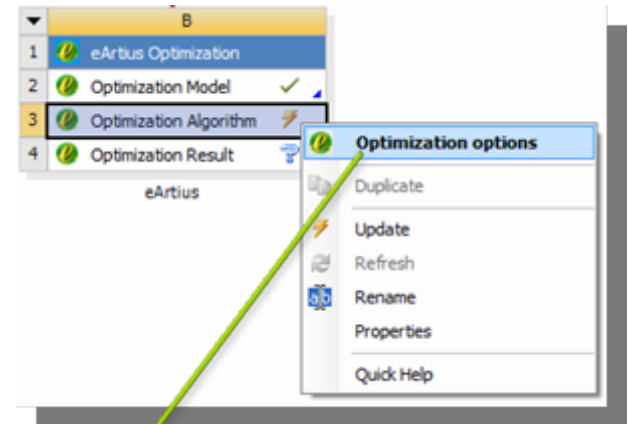


You can use
ANSYS properties

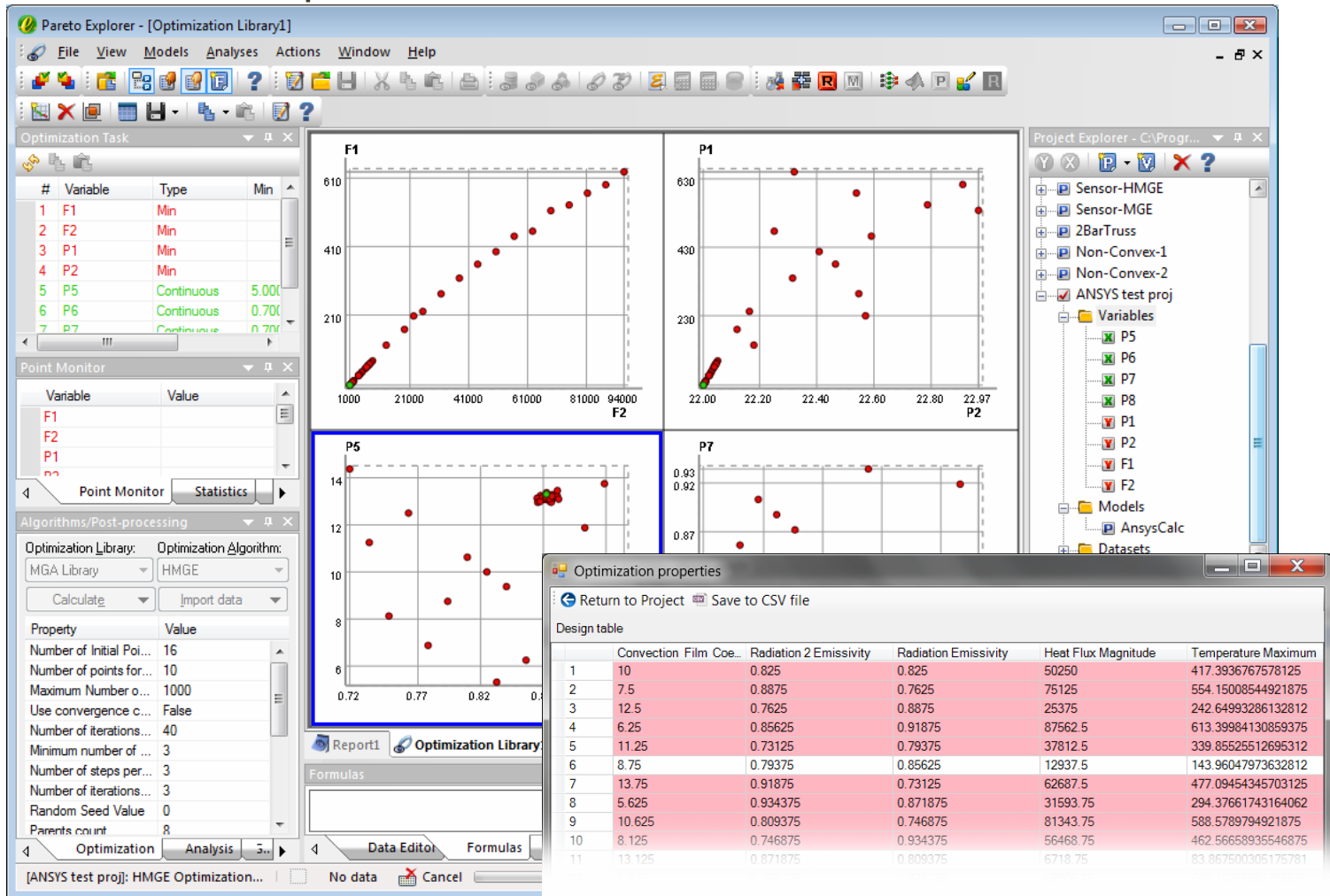


and user-defined
functions

Setting up an optimization algorithm properties

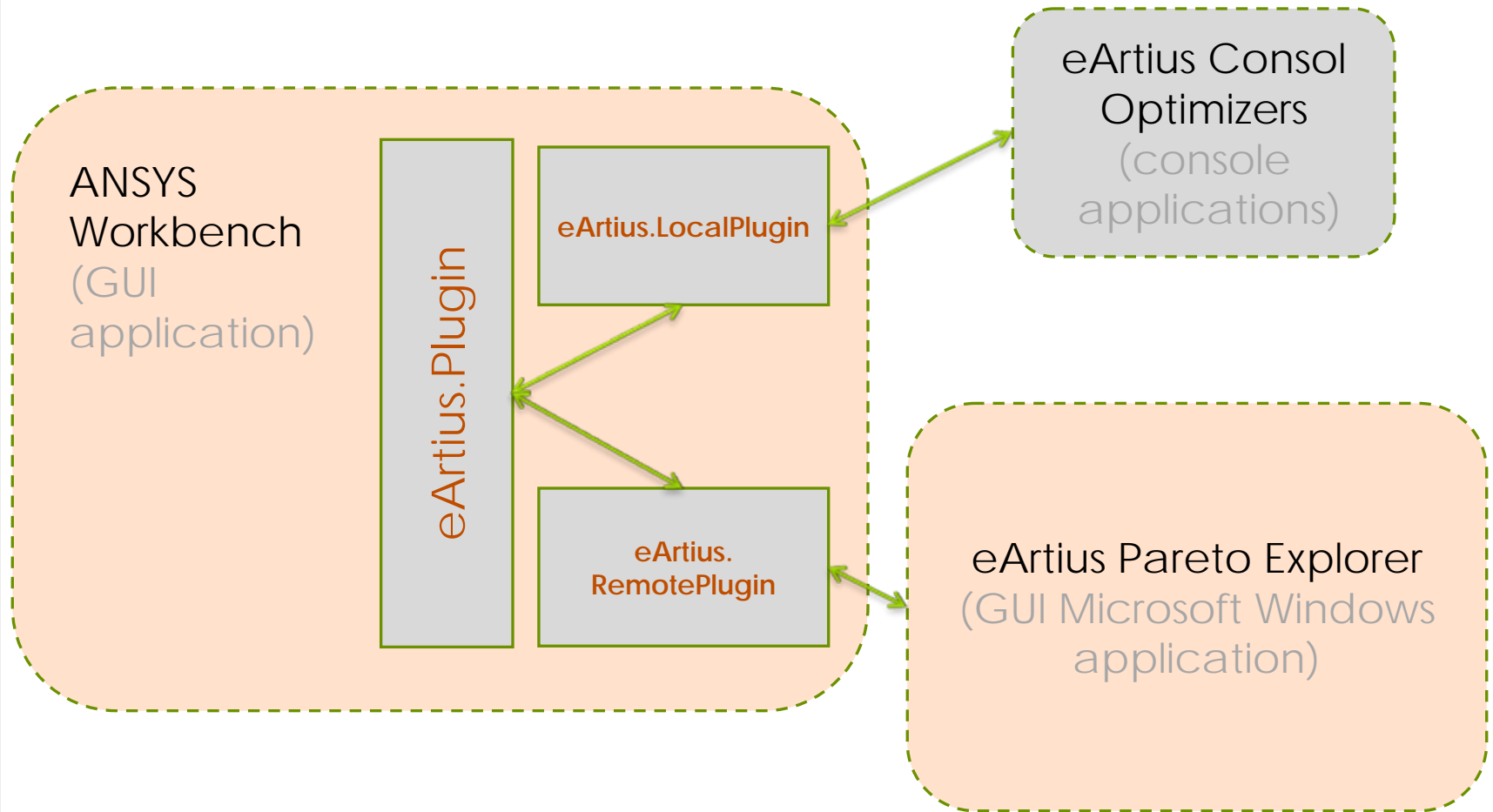


Observe optimization results in Workbench and Pareto Explorer



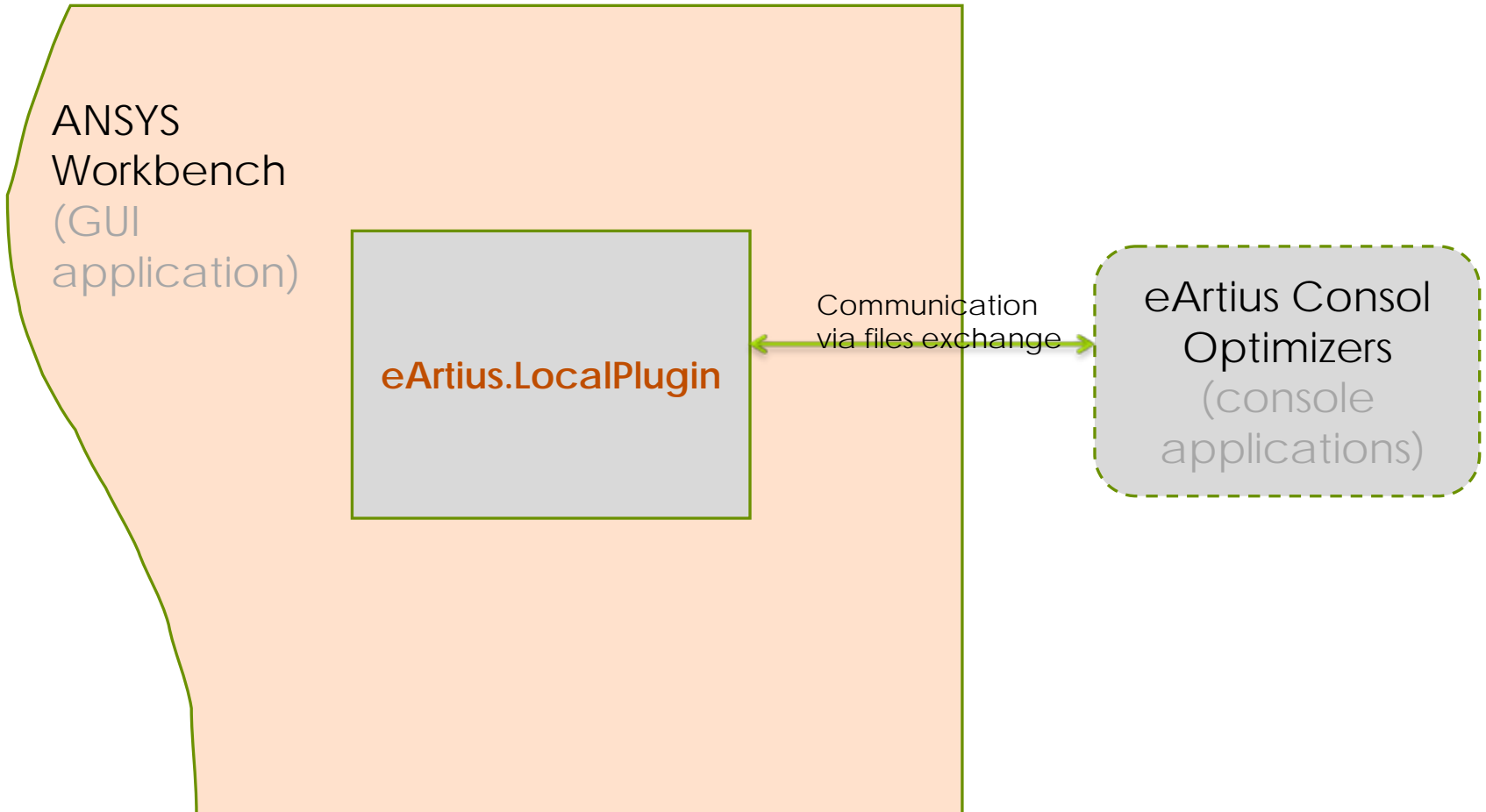
Interaction of ANSYS Workbench with eArtius Plug-ins

Overall scheme of interaction



Interaction of eArtius Local Plug-in with eArtius Console Optimization Modules

Interaction of Local Plug-in



Interaction of eArtius Remote Plug-in with eArtius Pareto Explorer standalone application

Interaction of Remote Plug-in

ANSYS
Workbench
(GUI
application)

**eArtius.Optimization.
Integrator**

Remote
communication
via TCP/IP

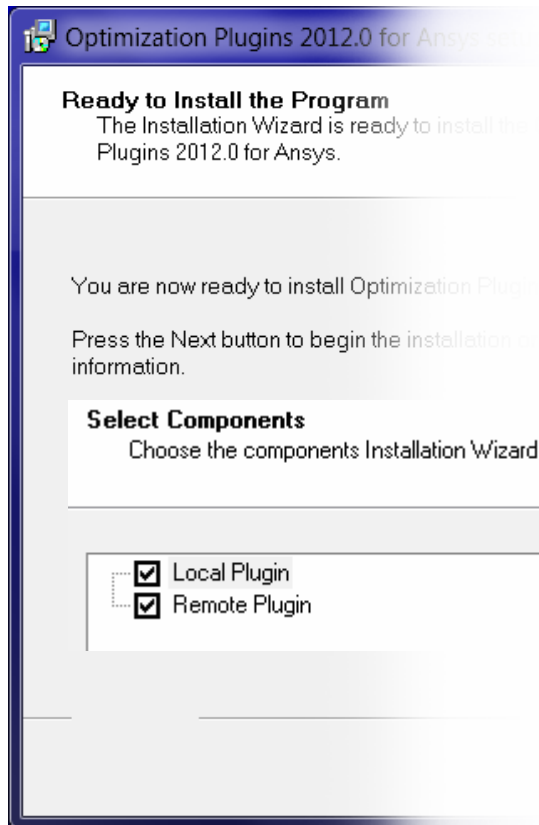
Inter-process
communication

**eArtius.
RemotePlugin**

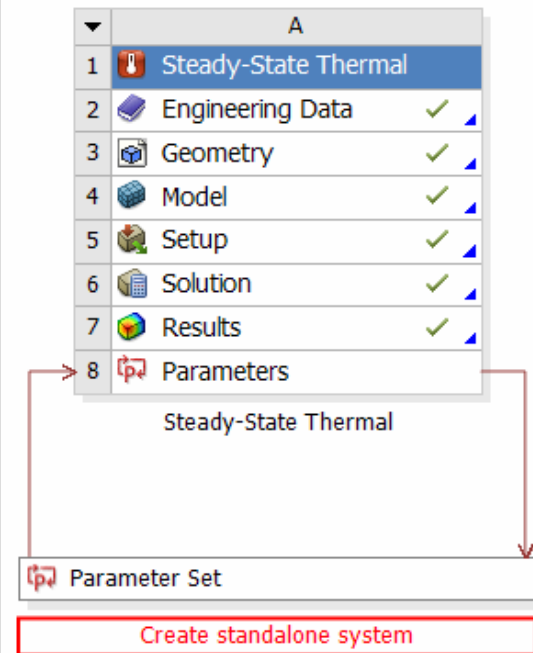
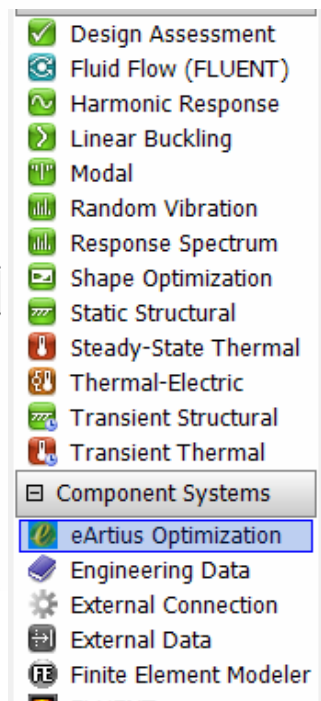
eArtius
Pareto
Explorer
(GUI
Microsoft
Windows
application)

Getting started

1. Install



2. Add to project



3. Define a simulation model and select an optimization algorithm

The screenshot displays the eArtius software interface during the configuration of an optimization model. The main window shows a tree view on the left with 'eArtius Optimization' selected. A 'Set optimization model' dialog is open, showing a table with the following data:

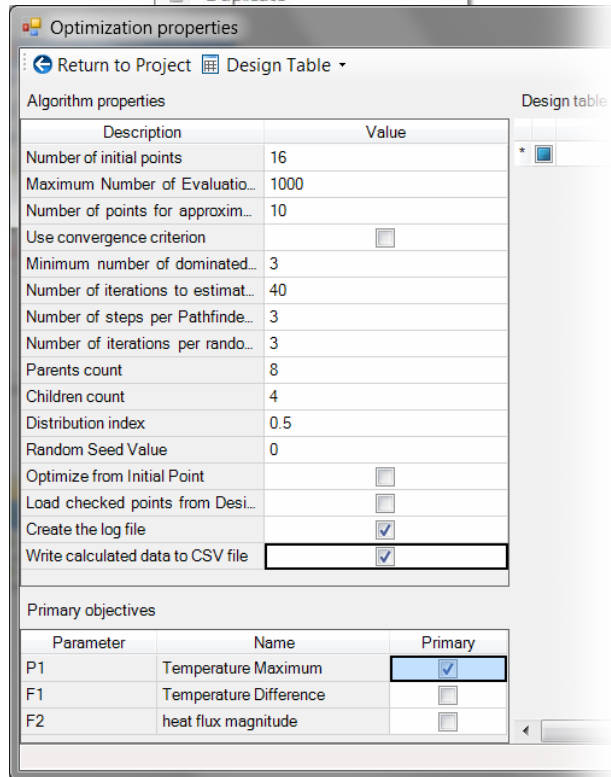
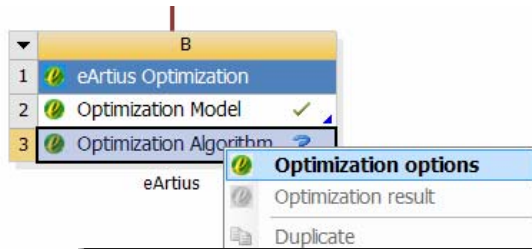
Component ID	Optimization Model
3	
4	eArtius
5	HMGE (Local)

The 'Model Properties' window is open, showing design variables and objectives:

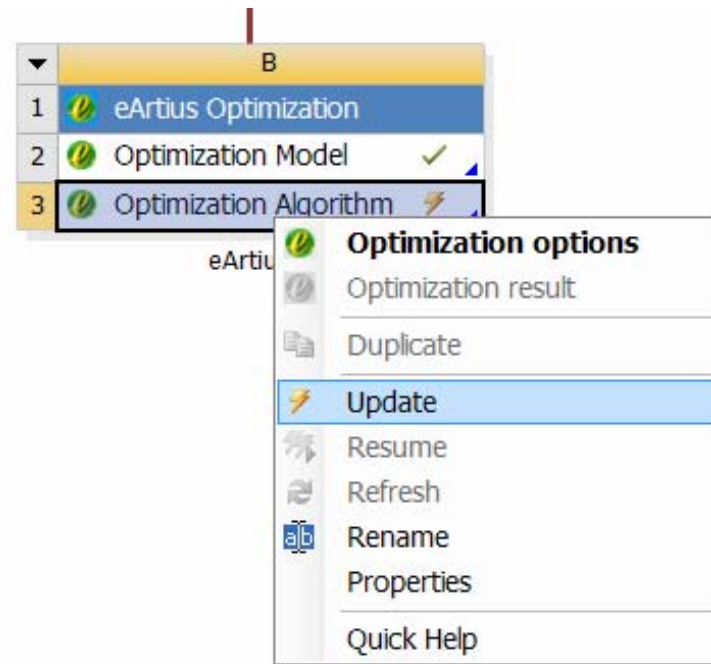
Design variables						Objectives			
Name	Description	Type	Min	Max	Init	Name	Description	Type	Min
P5	Convection Film Coefficient	Double	5	15	7	F1	Temperature Difference	Minimize	
P6	Radiation 2 Emissivity	Double	0.7	0.95	0.81	F2	heat flux magnitude	Maximize	
P7	Radiation Emissivity	Double	0.7	0.95	0.8	P1	Temperature Maximum	Minimize	20 150
P8	Heat Flux Magnitude	Double	500	100000	50000	P2	Temperature Minimum	No Action	20 150

The 'Formula Editor' window is also open, showing input parameters (P5-P8) and output parameters (P1-P4). The formula for F1 is set to P1-P2.

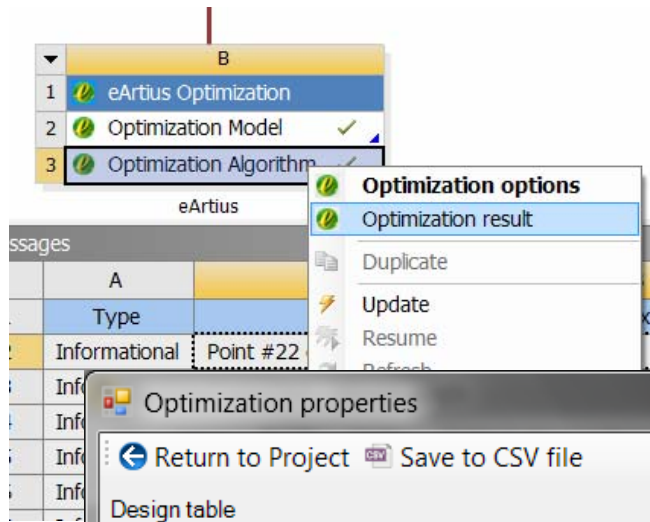
4. Specify parameters of the algorithm



5. Start optimization and wait



6. Check the optimization results in both local and remote modes



White – feasible designs
Red – infeasible designs

	Convection Film Coe...	Radiation 2 Emissivity	Radiation Emissivity	Heat Flux Magnitude	Temperature Maximum
1	10	0.825	0.825	50250	417.3936767578125
2	7.5	0.8875	0.7625	75125	554.15008544921875
3	12.5	0.7625	0.8875	25375	242.64993286132812
4	6.25	0.85625	0.91875	87562.5	613.39984130859375
5	11.25	0.73125	0.79375	37812.5	339.85525512695312
6	8.75	0.79375	0.85625	12937.5	143.96047973632812
7	13.75	0.91875	0.73125	62687.5	477.09454345703125
8	5.625	0.934375	0.871875	31593.75	294.37661743164062
9	10.625	0.809375	0.746875	81343.75	588.5789794921875
10	8.125	0.746875	0.934375	56468.75	462.56658935546875
11	13.125	0.871875	0.809375	6718.75	83.867500305175781

7. Observe runtime optimization results in remote mode

The screenshot displays the Pareto Explorer interface for an optimization task. The main workspace contains four scatter plots showing the relationship between different variables:

- F1 vs F2:** Shows a positive linear correlation between F1 (y-axis, 210 to 610) and F2 (x-axis, 1000 to 94000).
- P1 vs P2:** Shows a positive correlation between P1 (y-axis, 230 to 630) and P2 (x-axis, 22.00 to 22.97).
- P5 vs P6:** Shows a positive correlation between P5 (y-axis, 6 to 14) and P6 (x-axis, 0.72 to 0.93).
- P7 vs P8:** Shows a positive correlation between P7 (y-axis, 0.77 to 0.93) and P8 (x-axis, 1000 to 94000).

The left sidebar contains the following panels:

- Optimization Task:** A table listing variables and their types.

#	Variable	Type	Min
1	F1	Min	
2	F2	Min	
3	P1	Min	
4	P2	Min	
5	P5	Continuous	5.000
6	P6	Continuous	0.700
7	P7	Continuous	0.700
- Point Monitor:** A table for monitoring specific points.

Variable	Value
F1	
F2	
P1	
P2	
- Algorithms/Post-processing:** Configuration options for the optimization algorithm (HMGE) and post-processing steps.

The right sidebar shows the **Project Explorer** and **Properties** panels. The Project Explorer lists the project structure, including variables (P5, P6, P7, P8, P1, P2, F1, F2) and models. The Properties panel shows details for the selected 'Variables - Variables folder'.

At the bottom, the status bar indicates the current task: [ANSYS test proj]: HMGE Optimization... and shows a progress indicator of 1/40.

Intevac Use Case

“We beta tested WB13 interface with eArtius HMGE optimization using our actual design for next generation vacuum tool product development. That included direct Solid Works parametric geometry change, Design Modeler, Thermo-Electric and Transient Thermal radiation with APDL snippets. We were able to quickly improve our designs, and product is very easy to use – absolutely no barrier in fast transition to design optimization. This ease is a unique and most attractive feature of this new product. ANSYS customers will love it!”

Vladimir Kudriavtsev, Intevac Inc, Santa Clara, CA

Project Schematic

Parameter Set

Progress

A	
1	Status
2	Updating the Optimization Algorithm component in eArtius

Feasible

Messages

	A	B	C	D
1	Type	Text	A...	Date/Time
2	Informational	Prepared 4 points for calculation		3/5/2012 6:18:47 PM
3	Informational	Received new points for the calculation		3/5/2012 6:18:15 PM
4	Informational	Calculation finished successfully		3/5/2012 6:18:13 PM
5	Informational	Point 188 calculated		3/5/2012 6:18:08 PM
6	Informational	Point 187 calculated		3/5/2012 5:44:54 PM
7	Informational	Point 186 calculated		3/5/2012 5:10:45 PM
8	Informational	Point 185 calculated		3/5/2012 4:36:33 PM

Optimization options

- Optimization result
- Duplicate
- Update
- Resume
- Refresh

Questions?

