

**Ansys**

**WO****ST**

WORKSHOP 2022

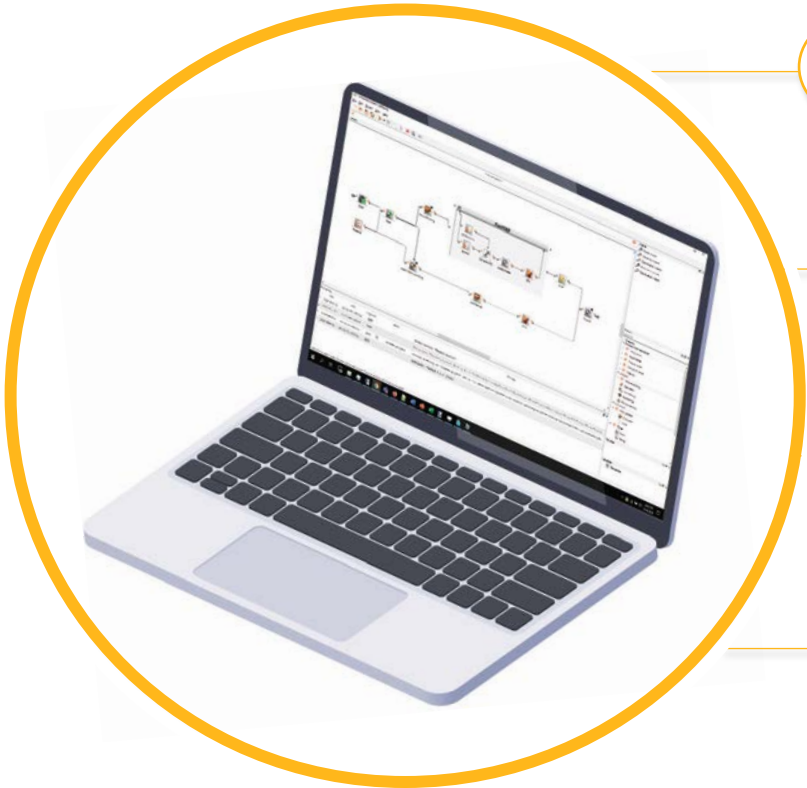
# optiSlang News

David Schneider

24.6.2022

**Ansys**

# 4 Key Pillars of optiSLang



Orchestrate and automate simulation workflows



Product design exploration and optimization



Evaluate product robustness



Package and publish automations for non-experts

# ANSYS optiSLang



Capabilities	Pro	Premium	Enterprise
<b>Design Studies</b>			
<i>Classic DOE</i>	✓	✓	✓
<i>Sampling &amp; Sensitivity Analysis</i>	✓	✓	✓
<i>Robust Design Optimization</i>	✓	✓	✓
Classic scalar meta-modeling	✓	✓	✓
<i>Reliability Analysis</i>		✓	✓
<b>Process Integration and Workflow Orchestration</b>			
Embedded in ANSYS	✓	✓	✓
<i>Build and automate workflows</i>		✓	✓
<i>Integrate 3rd party tools</i>		✓	✓
<i>App generation</i>			✓
<b>Advanced Meta Modeling &amp; AI/ML</b>			
Field meta-modeling (signals, 2D/3D)			✓
UQ for signals, 2D/3D			✓
<i>AI/ML for RDO</i>			✓
<b>Concurrent Solver Variant Licensing</b>			
Solver variations for parametric design study		+3	+7

## optiSLang Pro

**Get attracted to design studies**  
Offer unlimited Sensitivity Analysis, Robust Design Optimization, all from within the applications they are accustomed to using.

## optiSLang Premium

**Win the workflow**  
Accelerate engineering design studies by automating workflows with 3<sup>rd</sup> party tools and maximize customer ROI.

## optiSLang Enterprise

**Scale parametric design studies**  
Add advanced reduced order modeling and AI technology and deploy workflows across the engineering organization via Apps.



# Ansyes optiSLang – direct use of algorithms (embedded)

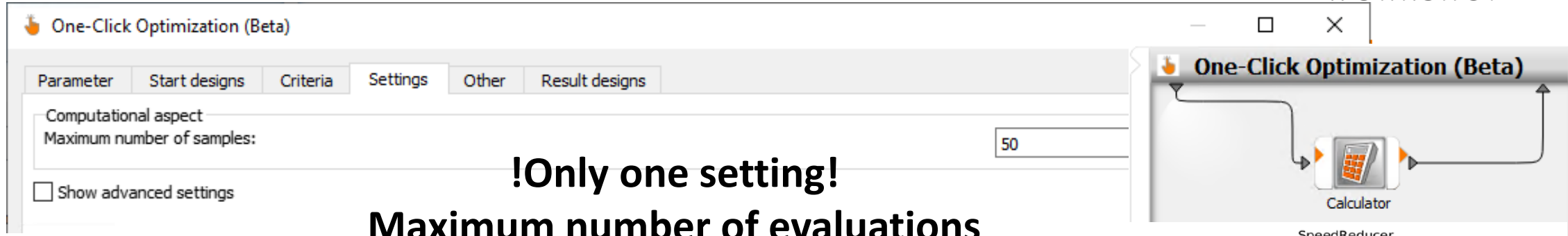
Capabilities	Pro
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Reliability Analysis	
<b>Process Integration and Workflow Orchestration</b>	
Embedded in ANSYS	✓
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<b>Concurrent Solver Variant Licensing</b>	
Solver variations for parametric design study	

The screenshot displays the ANSYS Workbench environment. On the left, the Project Manager shows a project named 'optiSLang\_in\_optimetrics\*' with a sub-project 'antenna (Terminal Network)\*'. A context menu is open over the 'optiSLangSetup1' component, with 'Create optiSLang Project...' selected. The Analysis Information panel on the right shows a workflow with four main stages: A (Mechanical APDL), B (Sensitivity), C (Optimization EA), and D (Robustness). Below this, a detailed workflow diagram shows the sequence: Setup (22 parameters) leads to Sampling (22 vars, 300 sp filling designs), which leads to Optimization (1 objective, 3 constraints). The Optimization stage is linked to Build Metamodels (16 mop surfaces) and Composites (4 definitions). A 3D surface plot of a 'Metamodel Surface' is shown in the bottom right, representing the optimization results.

AEDT, Workbench, LS-OPT  
... more to come ...



# One-Click-Optimization (OCO)

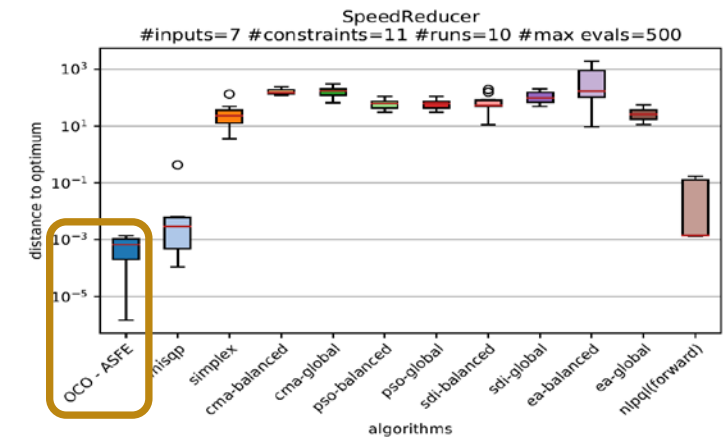


**!Only one setting!  
Maximum number of evaluations**

## Hybrid Optimization Strategy:

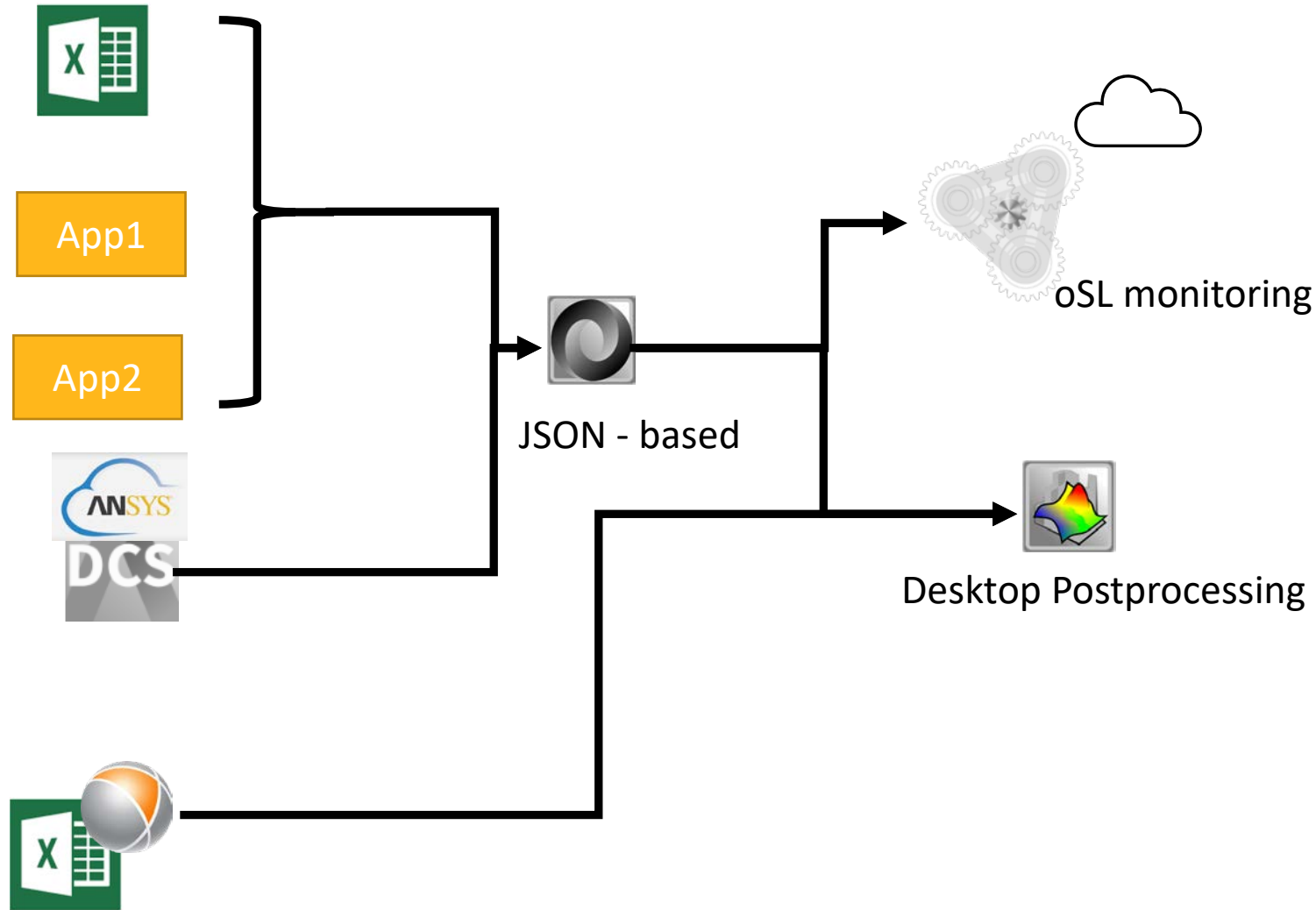
A surrogate assisted optimizer, automatically combining different algorithms.  
*Internal AI runs multiple optimization approaches simultaneously*

Requires a minimum of user knowledge and interaction.

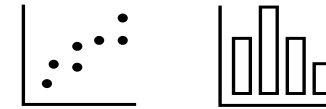


Roadmap	2020	2021	2022	2023
	<ul style="list-style-type: none"> <li>✓ Overview Science &amp; Competitors</li> </ul>	<ul style="list-style-type: none"> <li>✓ Concept (alpha) (2021R2)</li> <li>✓ Customer preview (2021R2)</li> </ul>	<ul style="list-style-type: none"> <li>✓ Beta Version (2022R1)</li> <li>✓ Multiobjective (2022R2)</li> </ul>	<ul style="list-style-type: none"> <li>✓ Release (2023R1)</li> </ul>

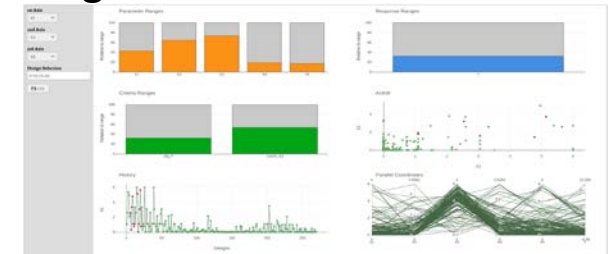
# Outlook: web-based monitoring library for DPs studies



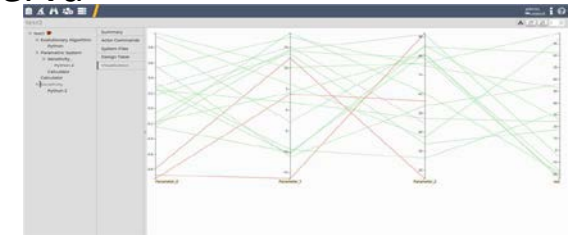
Ansys Flagship or other App



optiSLang



Minerva



➔ Same UX for all Ansys DP / parametric studies (Plots,... )





Mercedes-Benz

## Validation of ADAS using Reliability Analysis Methods to save a factor of 1000 simulations per scenario

*“The advanced reliability methods available in Ansys optiSLang enable Mercedes-Benz AG to make a safety statement for Level 3 ADAS using scenario-based simulation. Thanks to the efficient and robust methods, the number of necessary traffic simulations could be dramatically reduced in comparison to Monte Carlo Sampling. The Ansys optiSLang postprocessing, with which detailed analyzes of the results could be carried out, should also be emphasized.”*

**Maximilian Rasch**  
ADAS Validation Engineer  
Mercedes-Benz AG

**Zafer Kayatas**  
ADAS Validation Engineer  
Mercedes-Benz AG



Courtesy Mercedes-Benz AG

# ANSYS optiSLang – connect tools & algorithms

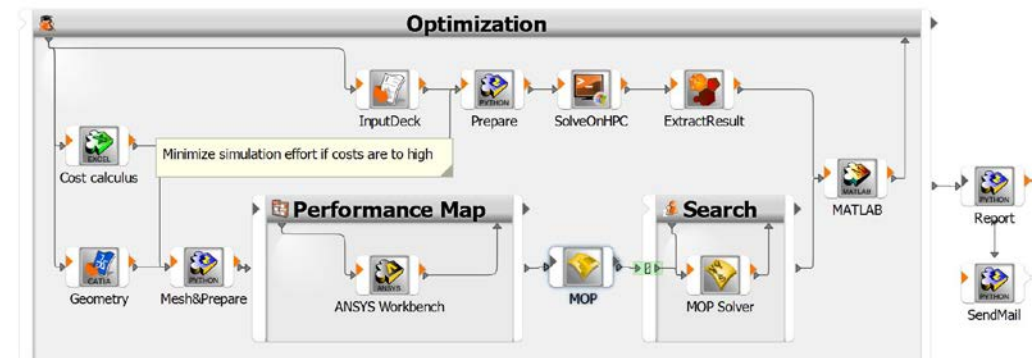


Capabilities	Premium
<b>Design Studies</b>	
Classic DOE	✓
Sampling & Sensitivity Analysis	✓
Robust Design Optimization	✓
Classic scalar meta-modeling	✓
Reliability Analysis	✓
<b>Process Integration and Workflow Orchestration</b>	
Embedded in ANSYS	✓
Build and automate workflows	✓
Integrate 3rd party tools	✓
App generation	
<b>Advanced Meta Modeling &amp; AI/ML</b>	
Field meta-modeling (signals, 2D/3D)	
UQ for signals, 2D/3D	
AI/ML for RDO	
<b>Concurrent Solver Variant Licensing</b>	
Solver variations for parametric design study	+3



Best in class connectors to  
The Ansys tools  
(incl. HPC licensing)

Direct plugins + open interfaces  
→ 150++ proprietary tools connected  
→ 100% vendor neutral



Linux/Windows, HPC&Cloud, Open API, GUI & Batch, ...





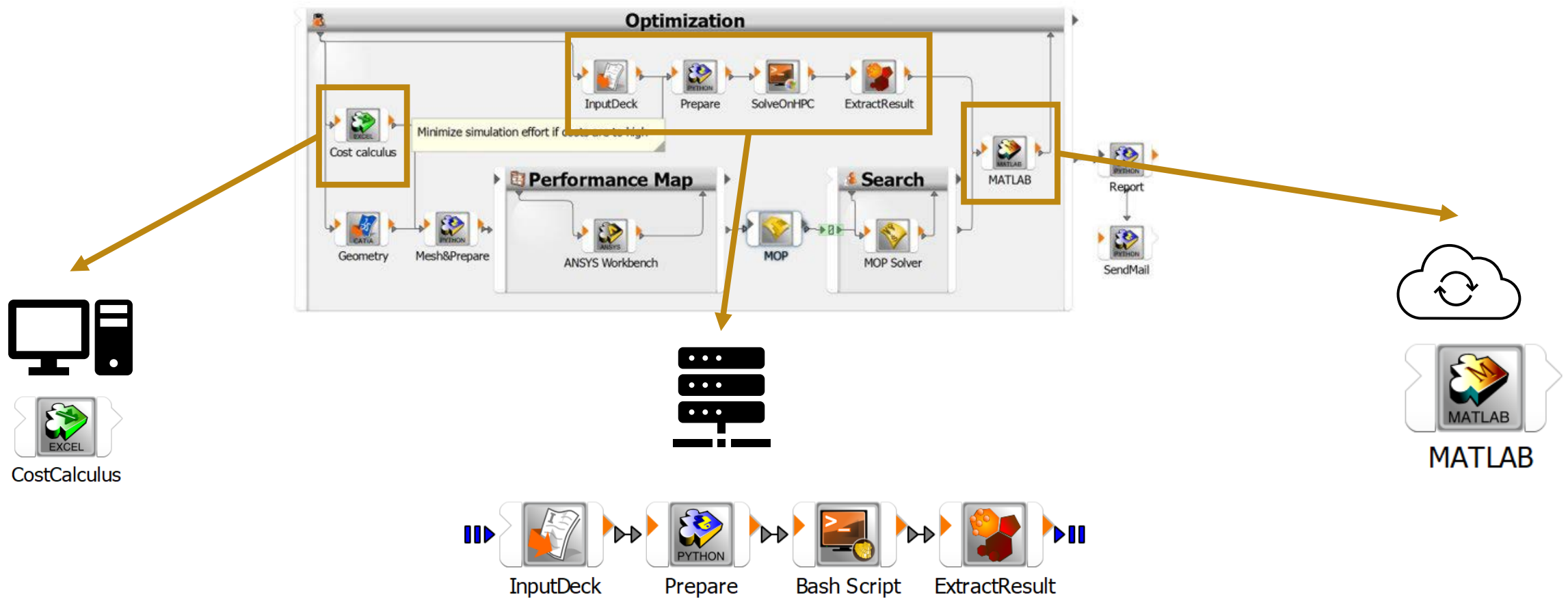
# Integrations



+ Many others (100+) connected by customer or Ansys Application Engineers – please contact us if your tool is not on this slide



# Outlook: Run nodes remotely





# Workflow status overview

- Web and Desktop based
- Filtering
- Statistics
- Perform Actions
  - Custom Python scripts
  - Can executed in "Actions" panel
  - Concurrently or sequentially
  - Desktop and Remote
- Interactive Message log

test\_minimal

Auto update

Summary Design Table Visualization Status Overview

Hid	Sensitivity	ten_bar_truss.s	Solver	Output files	AMOR
0.5	Red	Green	Green	Red	
0.6	Red	Green	Green	Red	
0.7	Green	Green	Green	Green	
0.8	Red	Green	Green	Red	
0.9	Green	Green	Green	Green	
0.10	Red	Green	Green	Red	
0.11	Green	Green	Green	Green	
0.12	Green	Green	Green	Green	
0.13	Green	Green	Green	Green	
0.14	Red	Green	Green	Red	
0.15	Green	Green	Green	Green	
0.16	Red	Green	Green	Red	
0.17	Orange	Green	Orange	Green	
0.18	Orange	Green	Orange	Green	
0.19	Orange	Green	Orange	Green	

Working Directory Actions

my\_script\_02

Execute for project

Execute for selection

Run in parallel

Run

Filters

Statistics

Settings

Node tree

Actions

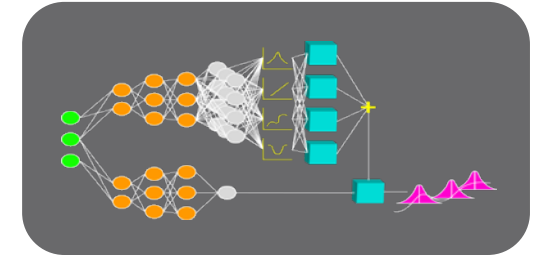
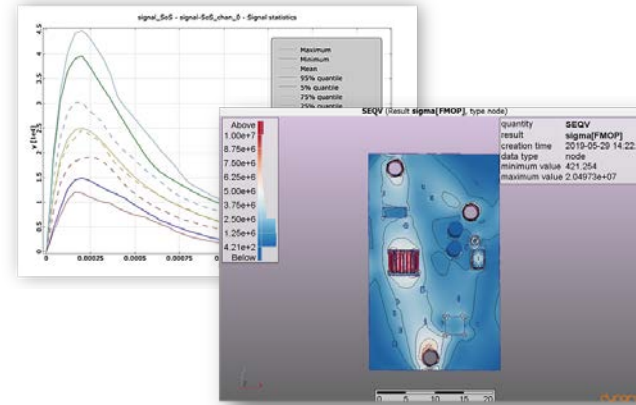
All

Timestamp ↓	Level	Node	Message
2022-Mar-24 10:45:13.592	INFO	ten_bar_truss.s	ten_bar_truss.s processed successfully [Design 40]
2022-Mar-24 10:45:13.584	INFO	Sensitivity	Sent Design 40
2022-Mar-24 10:45:13.582	INFO	ten_bar_truss.s	ten_bar_truss.s processed successfully [Design 39]
2022-Mar-24 10:45:13.575	INFO	Sensitivity	Sent Design 39
2022-Mar-24 10:45:13.572	INFO	ten_bar_truss.s	ten_bar_truss.s processed successfully [Design 38]
2022-Mar-24 10:45:13.554	INFO	Sensitivity	Sent Design 38
2022-Mar-24 10:45:13.550	INFO	ten_bar_truss.s	ten_bar_truss.s processed successfully [Design 37]

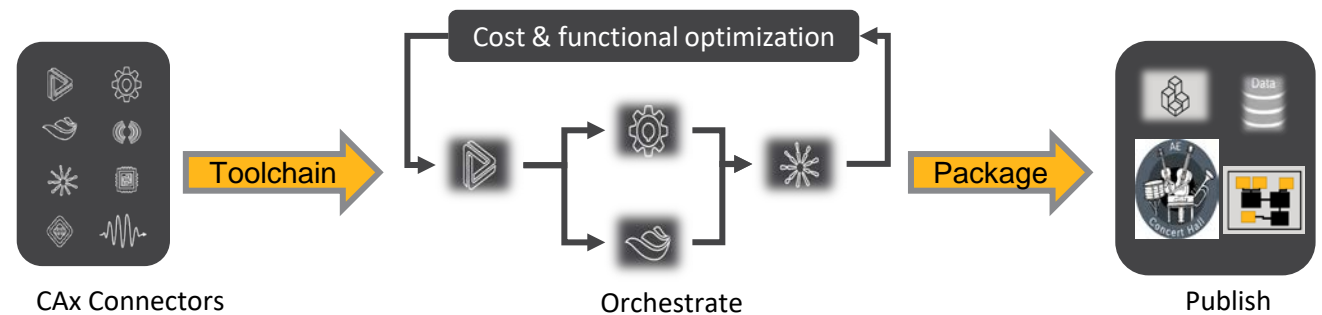
→ Full transparency and control over workflow on Desktop and in (web) Apps

# ANSYS optiSLang – Advanced Metamodeling & Apps

Capabilities	Enterprise
<b>Design Studies</b>	
Classic DOE	✓
Sampling & Sensitivity Analysis	✓
Robust Design Optimization	✓
Classic scalar meta-modeling	✓
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<b>Process Integration and Workflow Orchestration</b>	
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Solver variations for parametric design study	+7

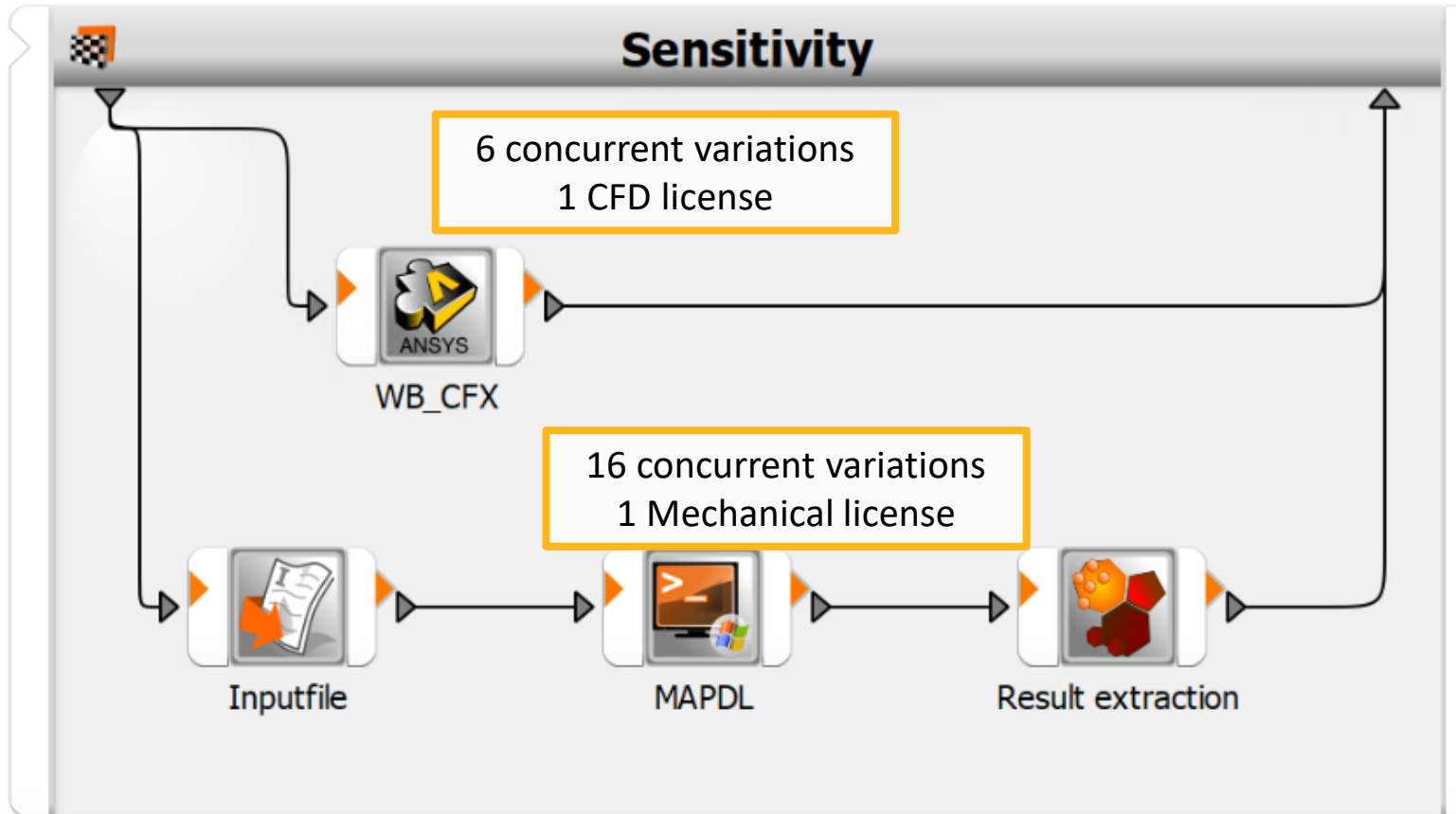


Outstanding Efficiency  
by consequent baselining and reuse of CAE engineering processes



# Concurrent design point variations

**Example: 3 optiSLang Enterprise licenses enable 22 concurrent variations**



## SKUs Required

1 CFD (pre + solve + post)  
1 Mechanical  
3 optiSLang Enterprise

- *Each solver can run on default number of cores before additional HPC licenses are required*
- *After the optiSLang pool of variations is consumed additional HPC-based variations or solver licenses can be used for concurrent variations*

# / PIDO App Generation

Easily generate and publish optiSLang workflows



# Test-Run & Desktop App

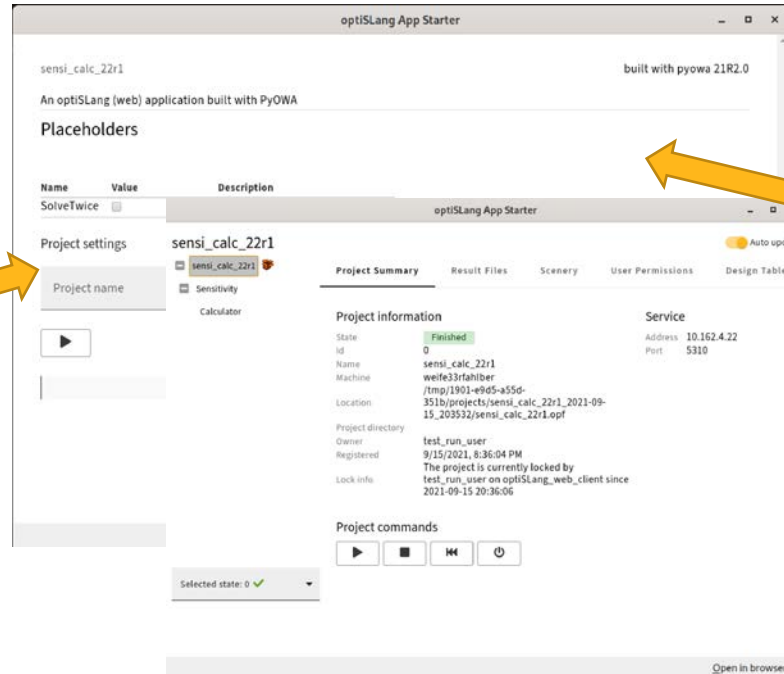
optiSLang App Generation Wizard

**optiSLang App Test Run**  
Perform local optiSLang App Test-Run

→ Test-Run  
Perform local optiSLang App Test-Run

## Test-Run

- New part of App Generation wizard



Earlier this year (7)

- \_123\_test\_123.owa
- pyowa\_wizard\_aa.owa
- Gas\_Turbine\_Optimization\_on\_Metamodel.o...
- Gas\_Turbine\_DOE\_and\_Optimization.owa
- Gas\_Turbine\_Analysis.owa

## Desktop App

- Start an optiSLang App from Desktop
- Double Click on \*.owa file

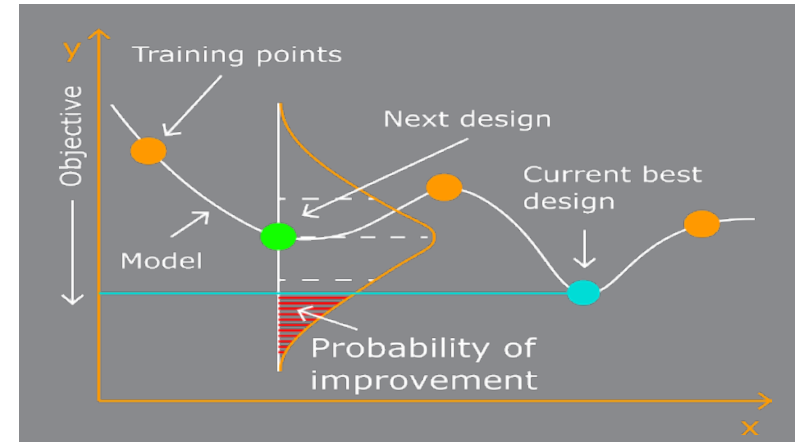
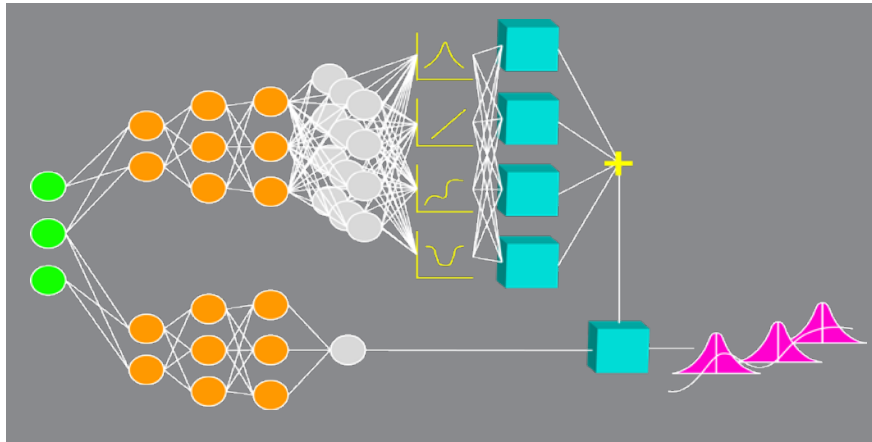
## Temporary run with Local (Test-Run) user

- Monitoring and all Web-App capabilities available
- Includes pyowa etc.

- ➔ Smart testing before upload to central Web App hosting service
- ➔ “Democratize” with optiSLang App’s without large IT deployment

# Extended partnership with Probaligence

- Probaligence algorithms are now integrated part of optiSLang Enterprise



“I am very happy that we have succeeded in bringing together the best solution for design studies- Ansys optiSLang, the most user-friendly and flexible environment and the most efficient methods of stochastics and optimization for big data analysis from Probaligence into one tool and now combining our strengths.”

Prof. Dr. Dirk Roos

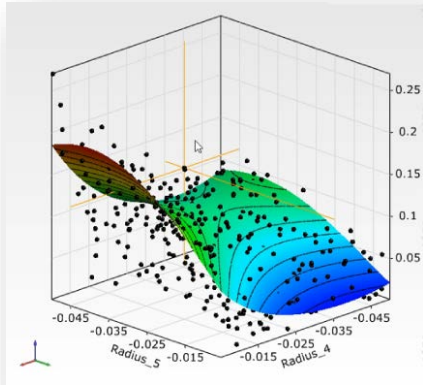




# Statistics on Structures now part of optiSLang

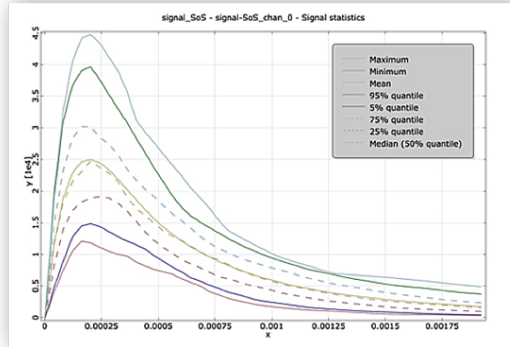
## 0D: Scalars

### MOP



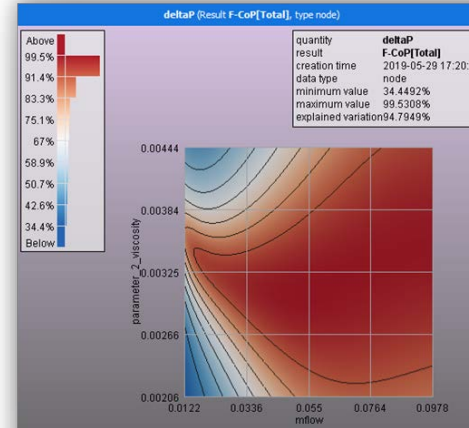
## 1D: Signal

### Signal-MOP



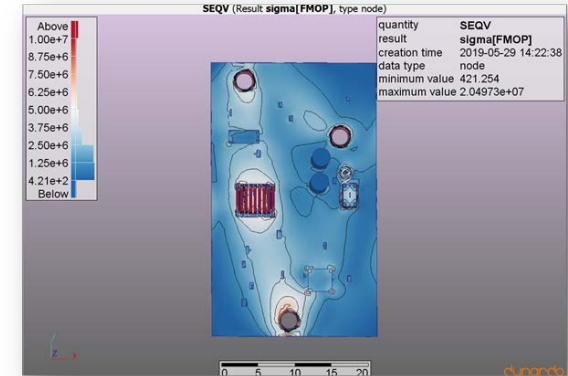
## 2D: e.g. Wavefronts, Performance maps

### Field-MOP



## 3D: Stress fields, deformations

### Field-MOP

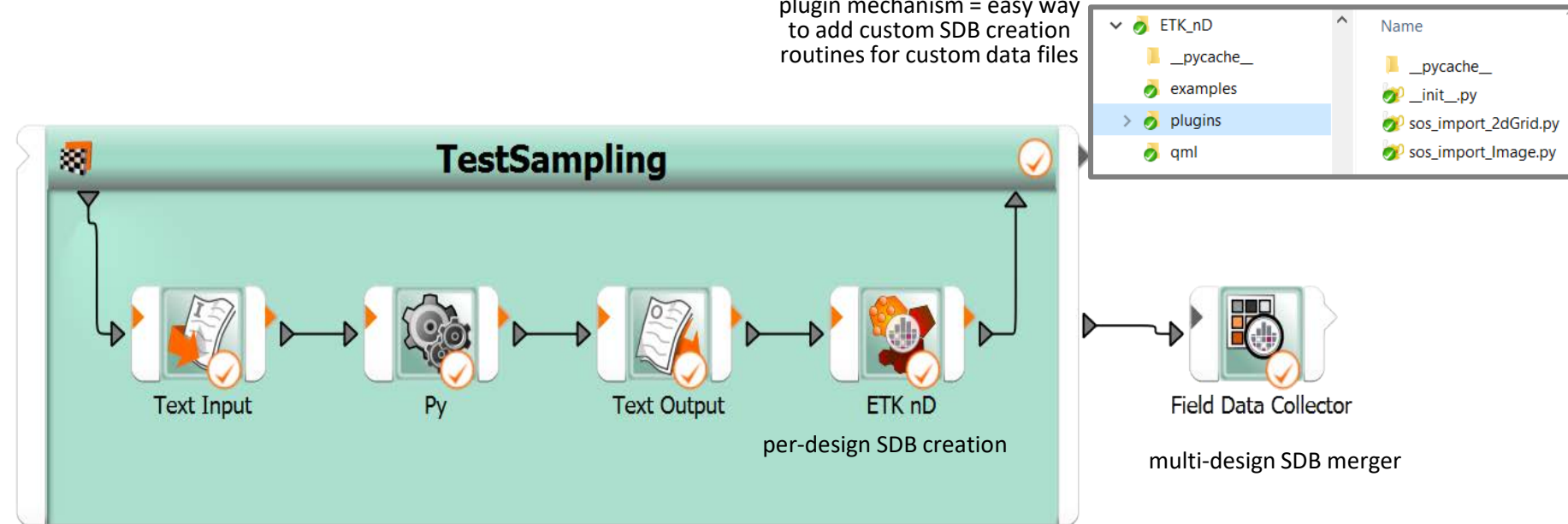


# Outlook: 2D/3D MOP + UQ in workflow

- New ETK node for n-Dimensional data
  - Plugin Mechanism for several formats
  - Starting with Image format
- Field Data collector
  - Prepares data for FMOP



plugin mechanism = easy way to add custom SDB creation routines for custom data files



- Make strong Statistics on Structures functionality available without scripting
- Initial step for Easy&Safe 2D/3D Statistics and Metamodels

# Outlook: Field-MOP Web Viewer

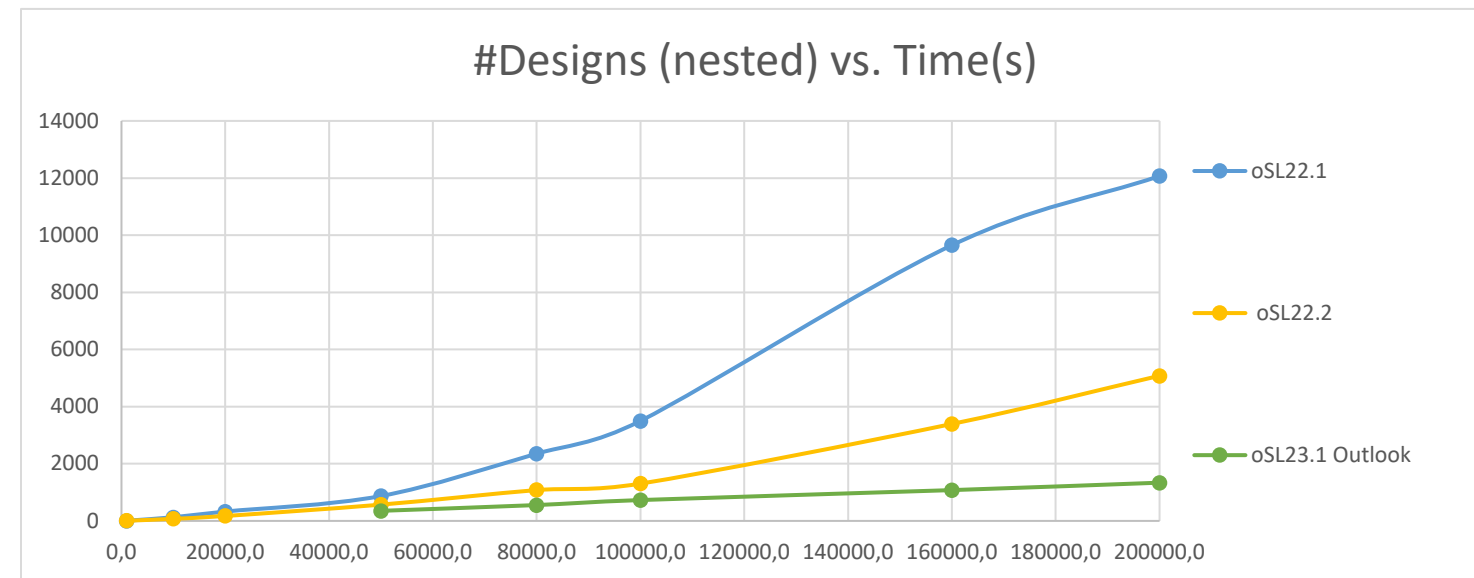
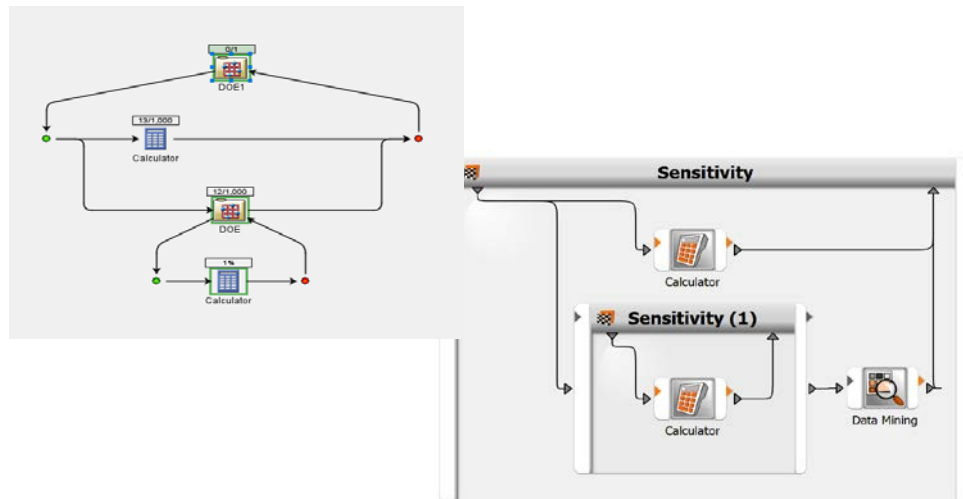
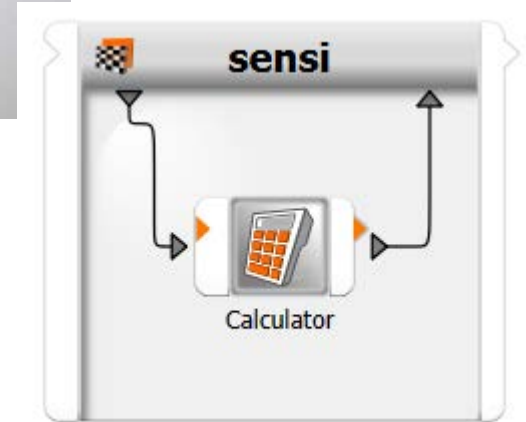
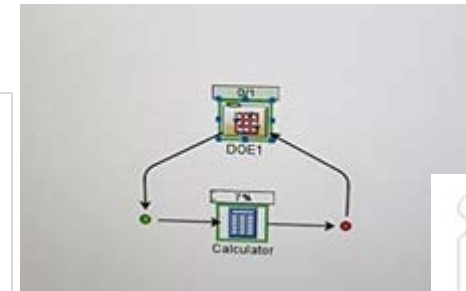
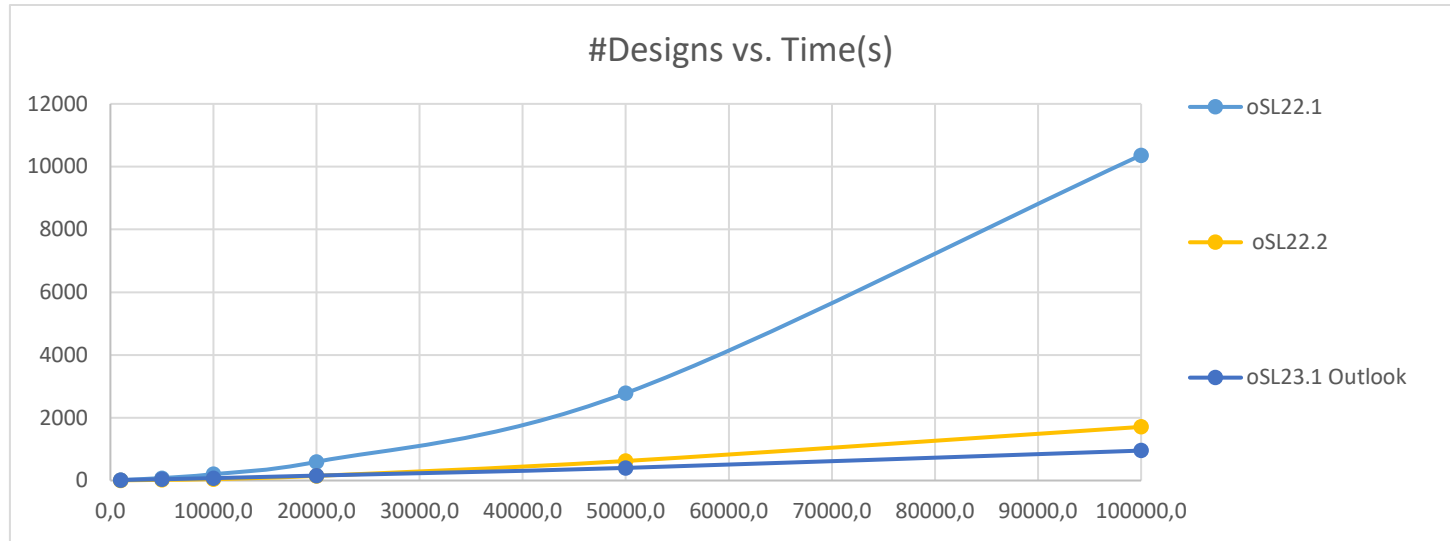
- Include Field-MOPs in Apps
- For
  - Vizualization
  - What-If analysis
  - ...
- Example available
  - Pyowa based



**... one more ...**

(we know you complaint a lot)

# Some „small“ improvements made



Thank you



But, what about you?

- Your feedback
- Your requests / ideas ...
- You want to have preview versions of new releases?
- ...



**Ansys**

**WO****ST**

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WORKSHOP



# Positive Business Outcomes of optiSLang



**6X**

More projects



**45%**

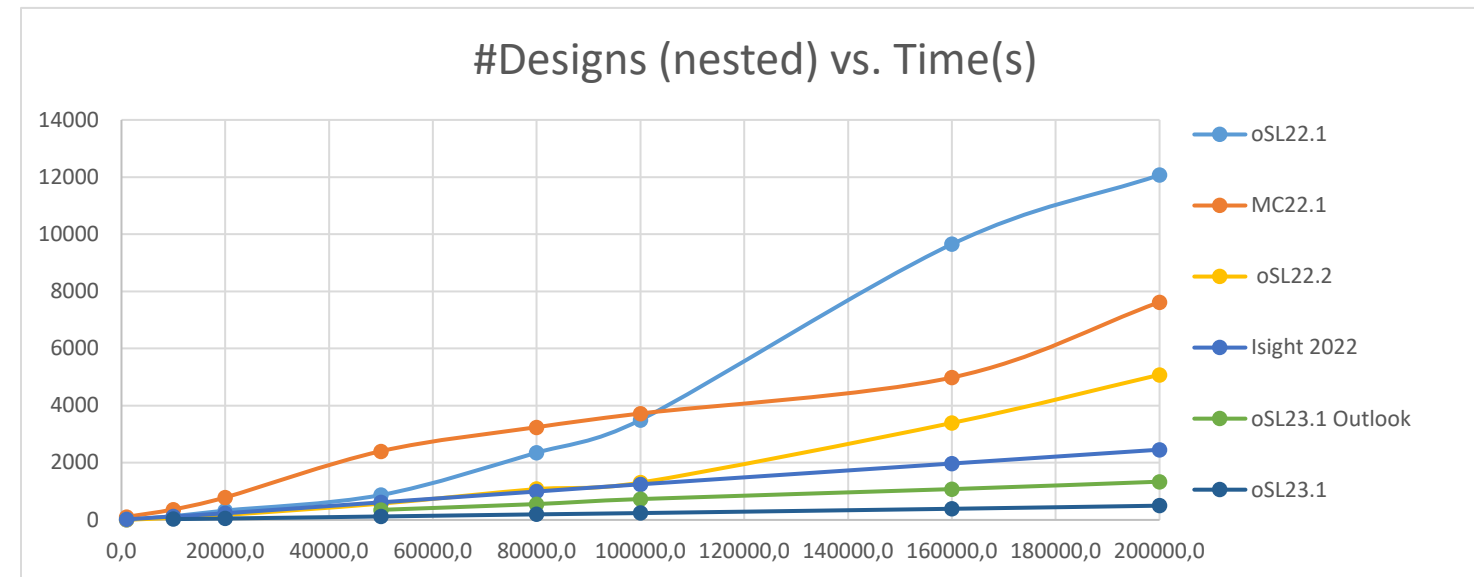
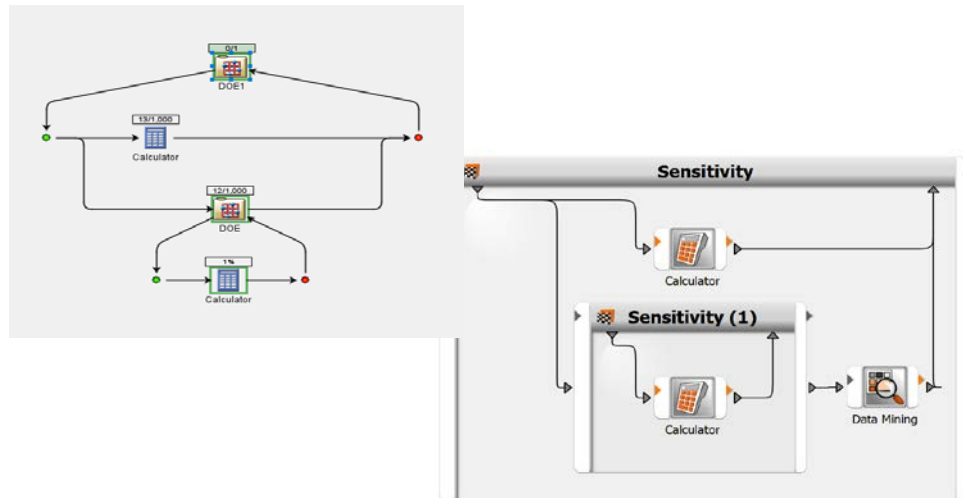
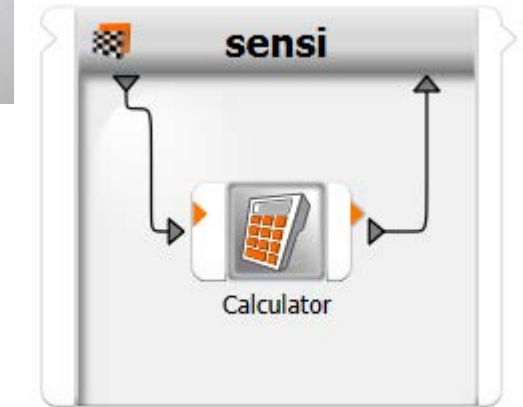
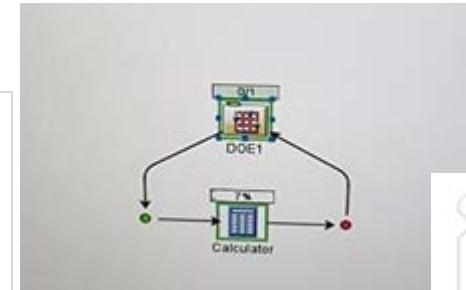
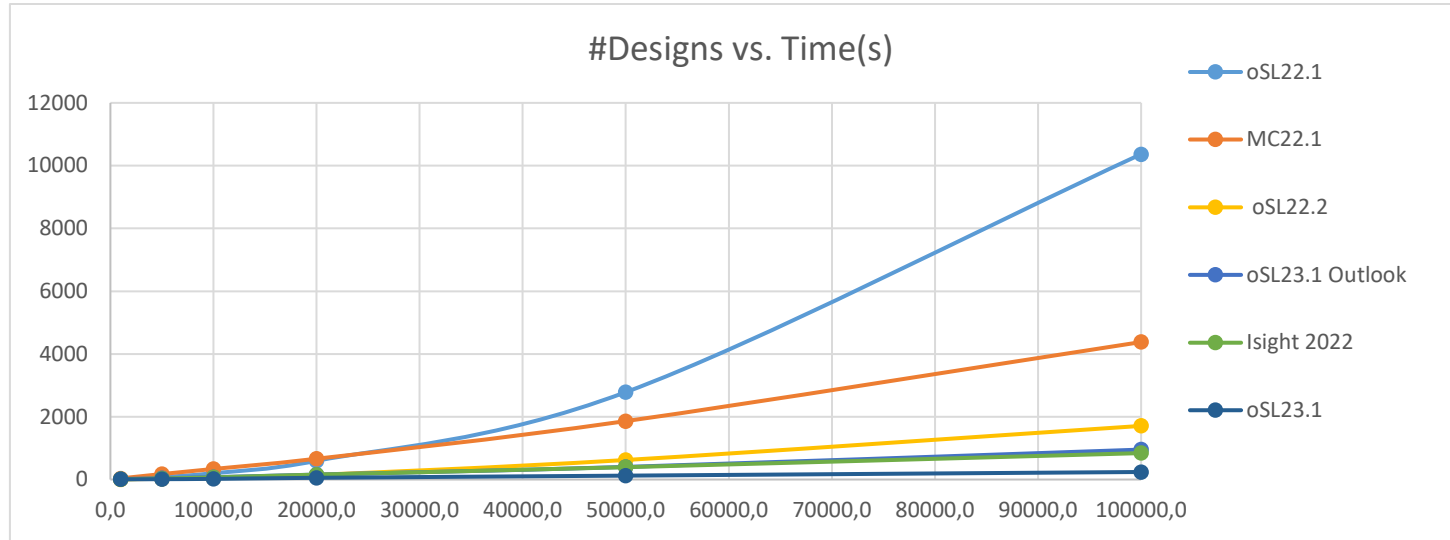
Saved Engineering Time



**27%**

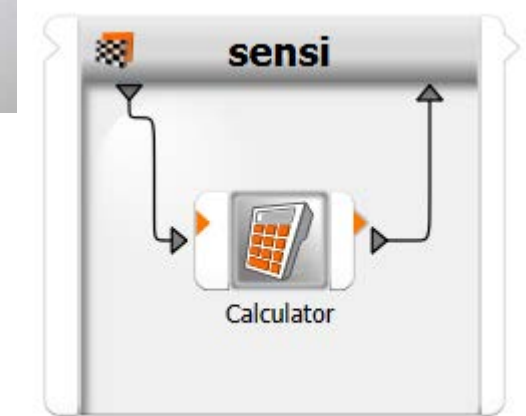
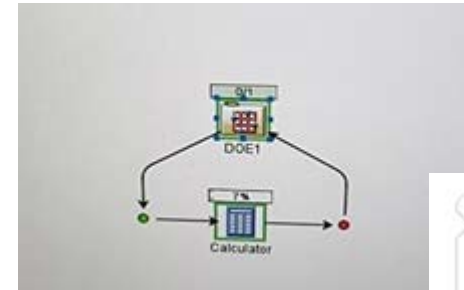
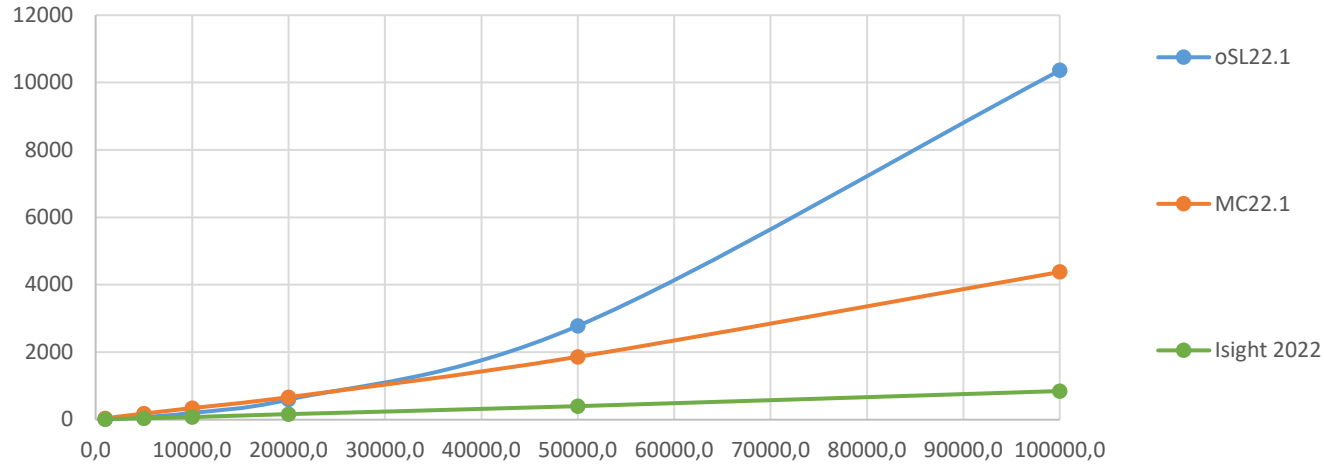
Lowered Design Cost

# Some „small“ improvements made



# Some „small“ improvements made

#Designs vs. Time(s)



#Designs (nested) vs. Time(s)

