Next Generation Domain-Services
in PL-Grid Infrastructure for Polish Science

Interactive Scientific Research with the Data Farming Methodology and the Scalarm Platform

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SCALARM

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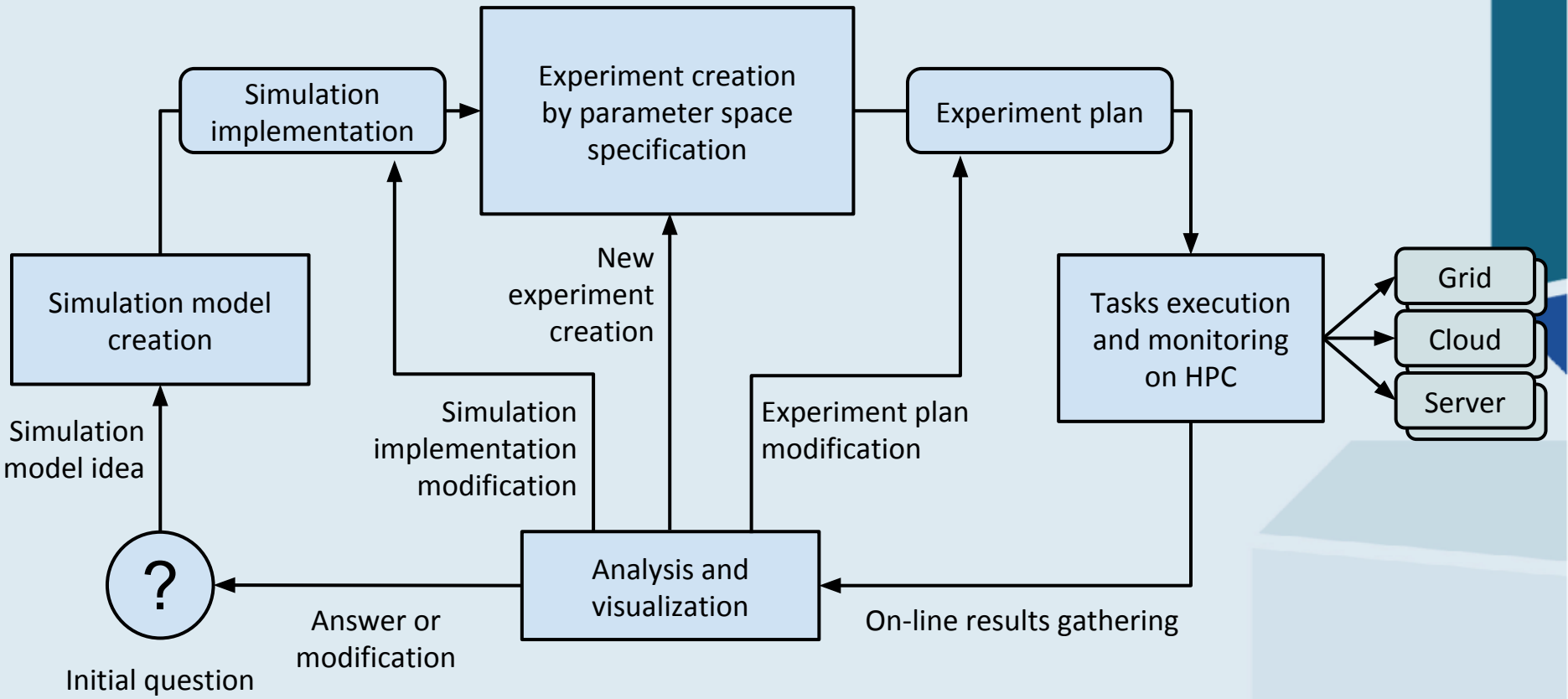
Agenda

- A common research case - assumptions
- Data farming methodology
- Interactive data farming process with Scalarm
  - Example of Immunological Evolutionary Multi-Agent System optimization
- Summary and future works

Research assumptions

- Simulations
  - Simulation as a “black box”
  - Behavior study in various configurations
- Goals
  - Interesting results discovery
  - Optimal simulation configuration discovery
  - Simulation model and implementation optimization
- An example
  - Validation and search for optimal configuration of developed algorithm

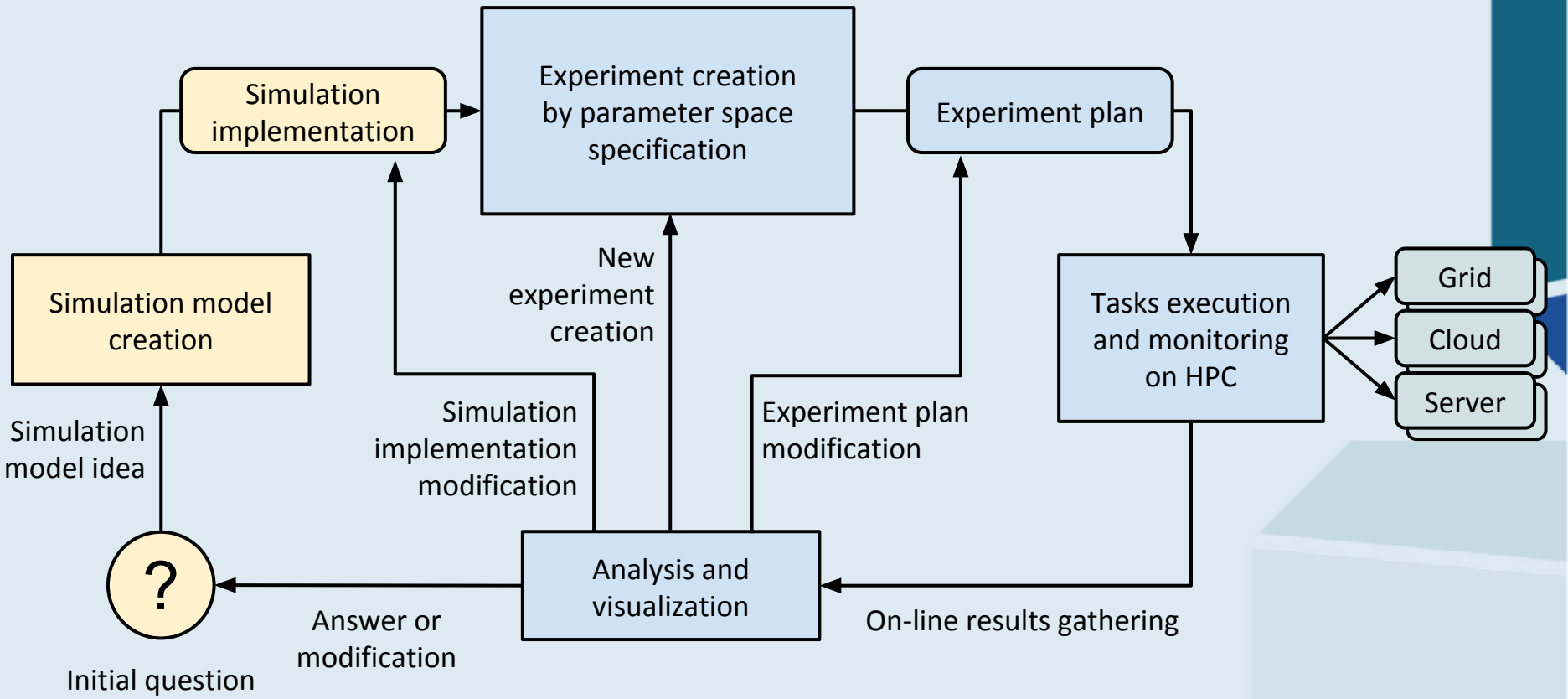
Data Farming Process with The Scalarm Platform



Experiment Example: Optimization and Testing of IEMAS

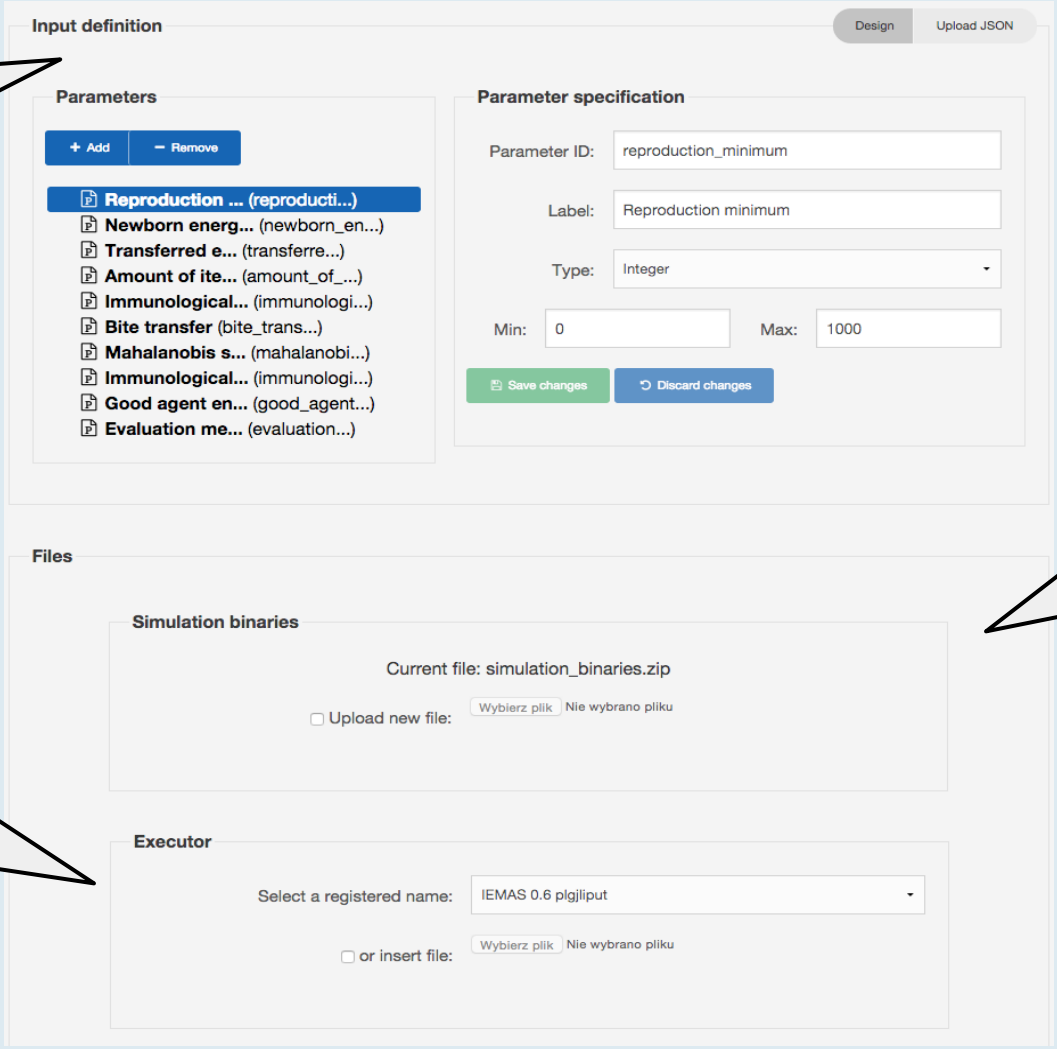
- Evolutionary Multi-Agent System (EMAS)
  - **Intelligent Information Systems Group AGH**
  - Multi-agent metaheuristics without global control
  - An agent represents a solution of optimization problem
- Immunological Evolutionary Multi-Agent System (IEMAS)
  - **dr hab. inż. M. Kisiel-Dorohinicki, D. Kluba, D. Wojciechowski**
  - Extension of EMAS with immunological mechanisms
- Data Farming experiment goals
  - Validation and efficiency check of IEMAS in various configurations
  - Evaluation of IEMAS implementation extensions

Data Farming in Scalarm Platform: Simulation creation



Data Farming in Scalarm Platform: Simulation creation

Definition of input



Your simulation binaries

Script to run simulation

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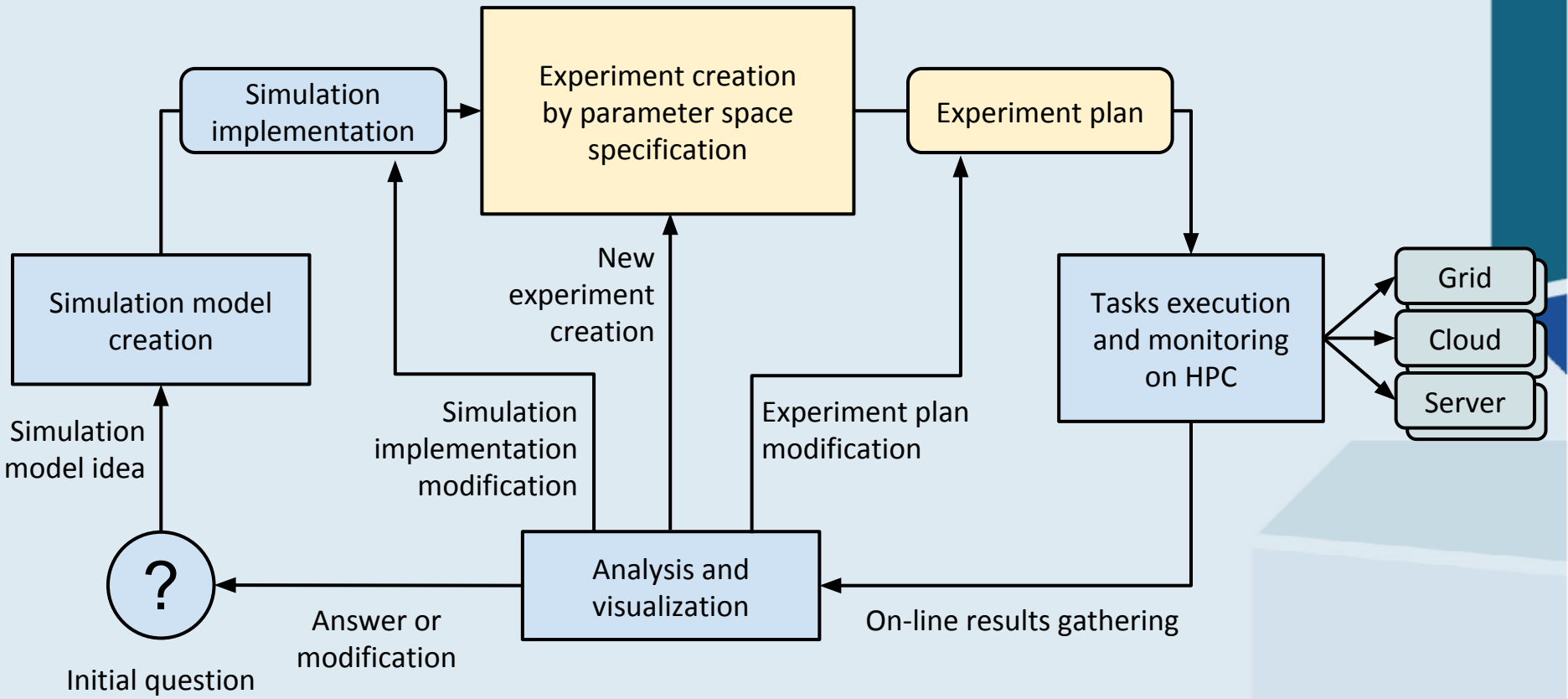
Data Farming in Scalarm Platform: Experiment Creation



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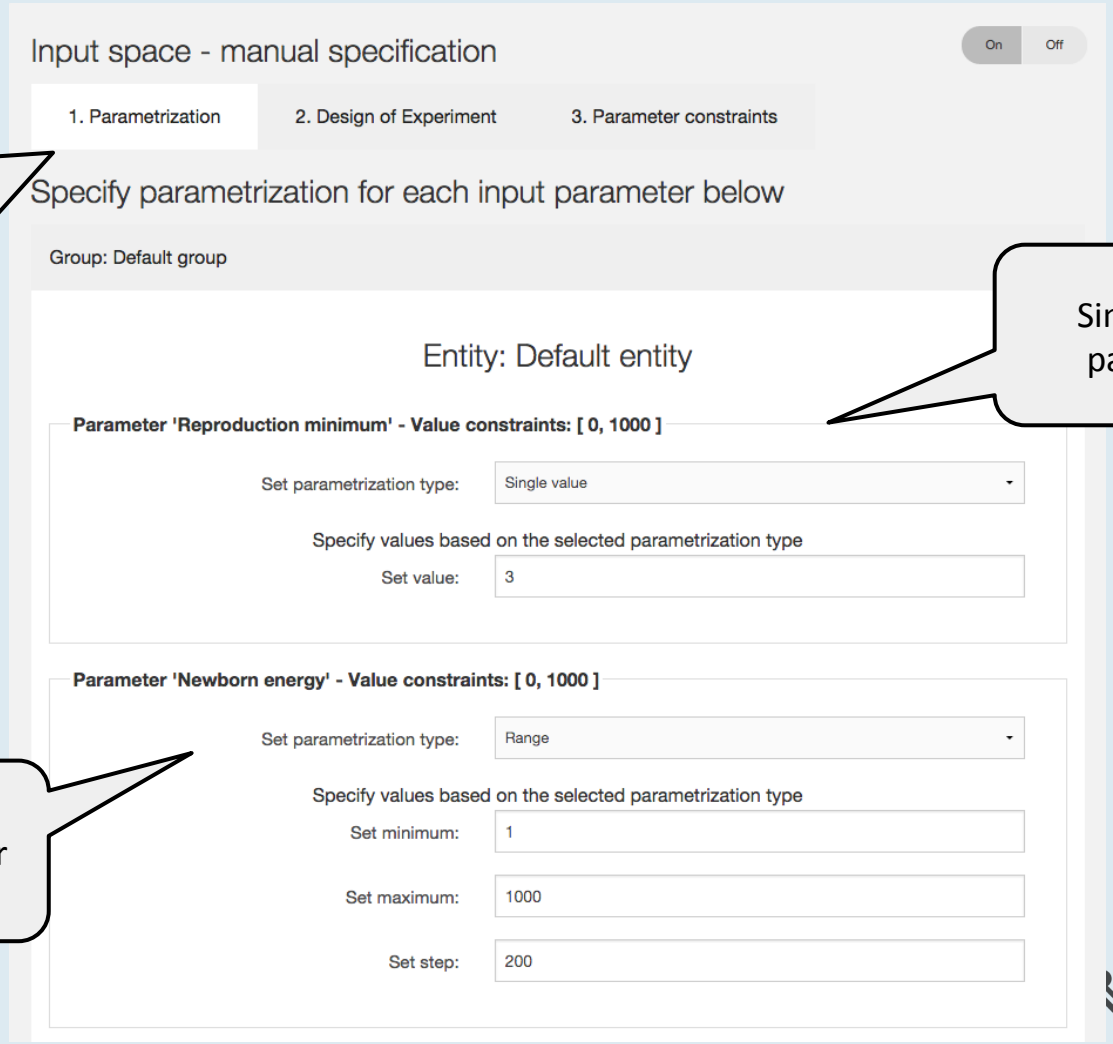

3 tabs:
- ➔ basic
- ➔ DoE
- ➔ constraints

Single value parameter

Range parameter

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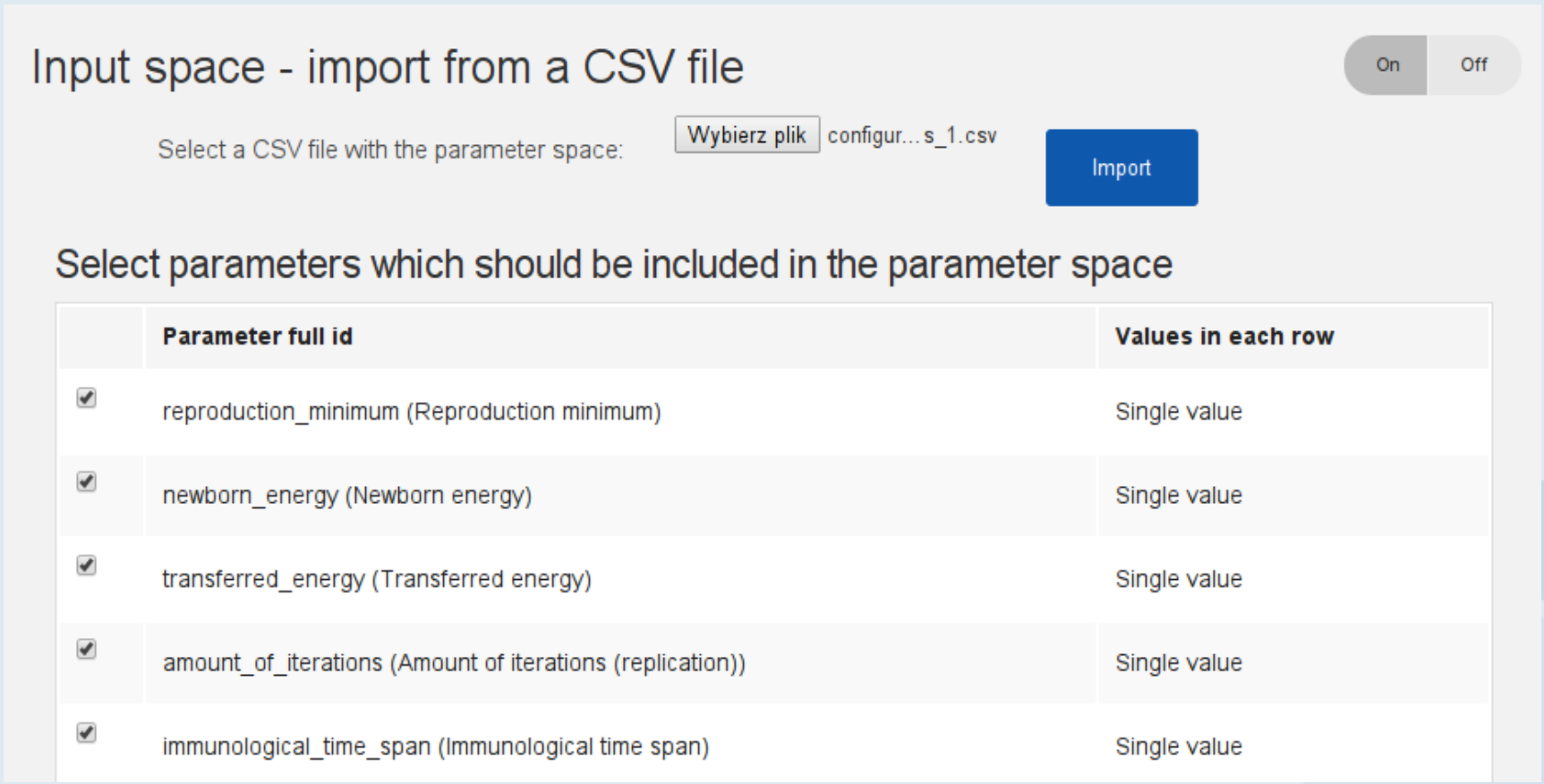
Data Farming in Scalarm Platform: Experiment Creation



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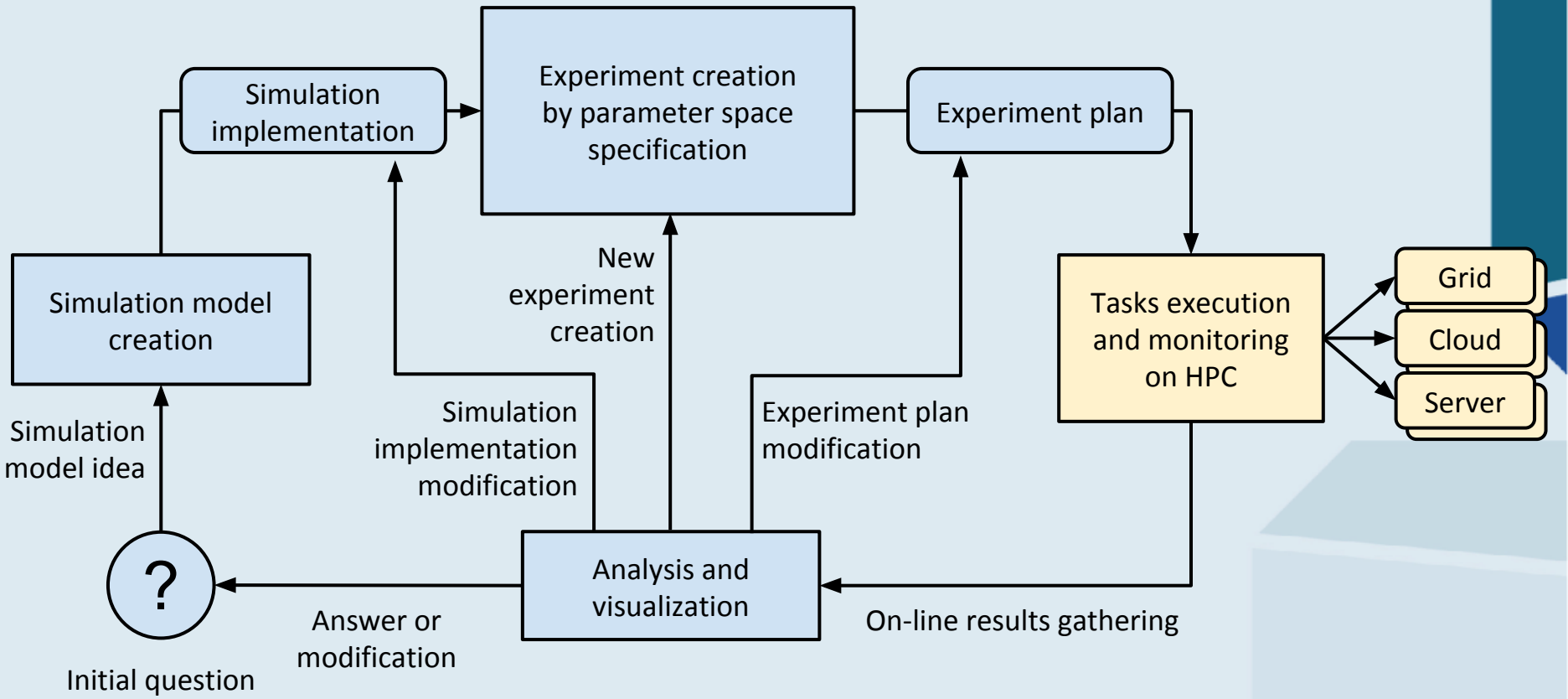
Data Farming in Scalarm Platform: Simulations execution



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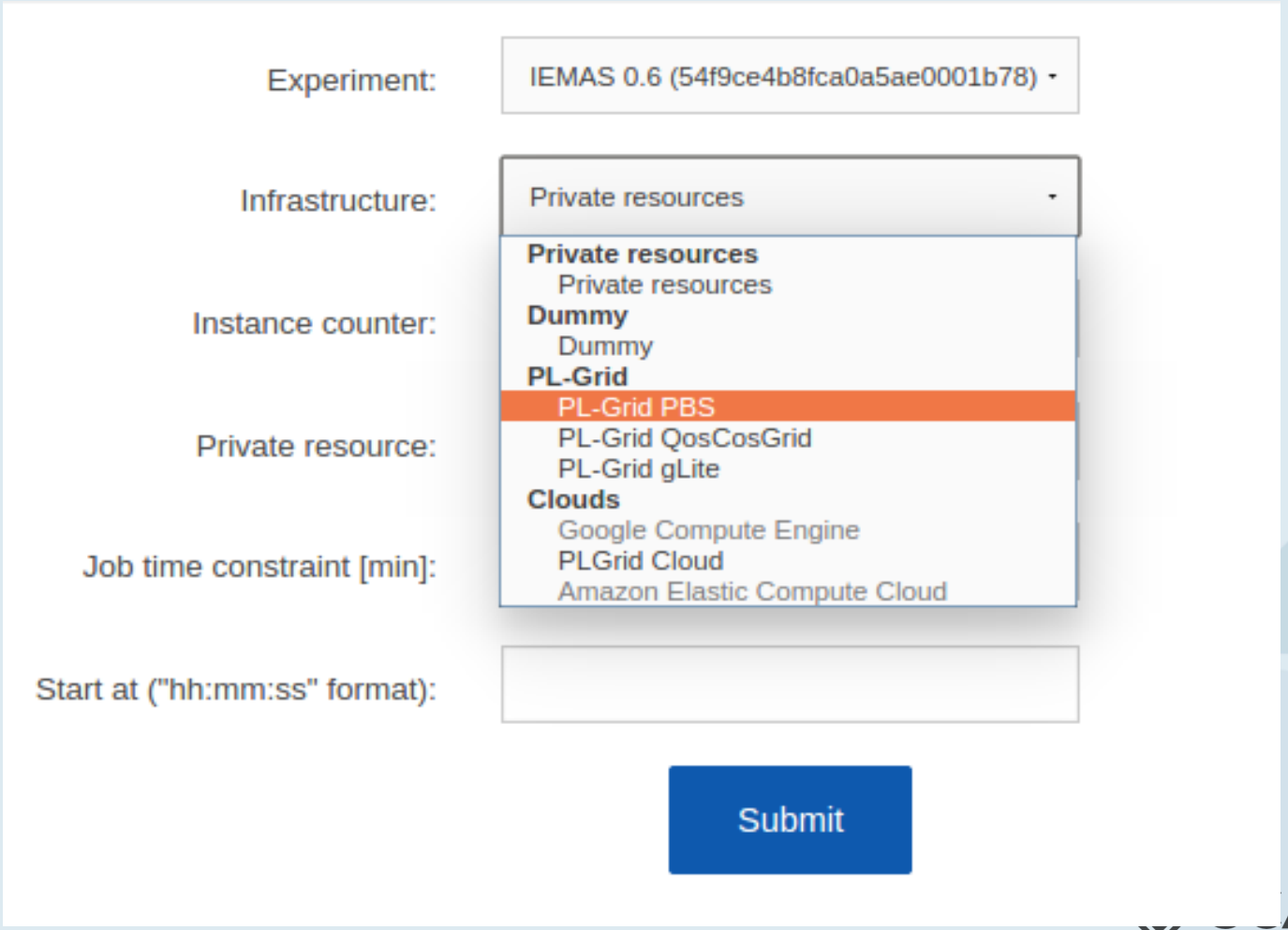

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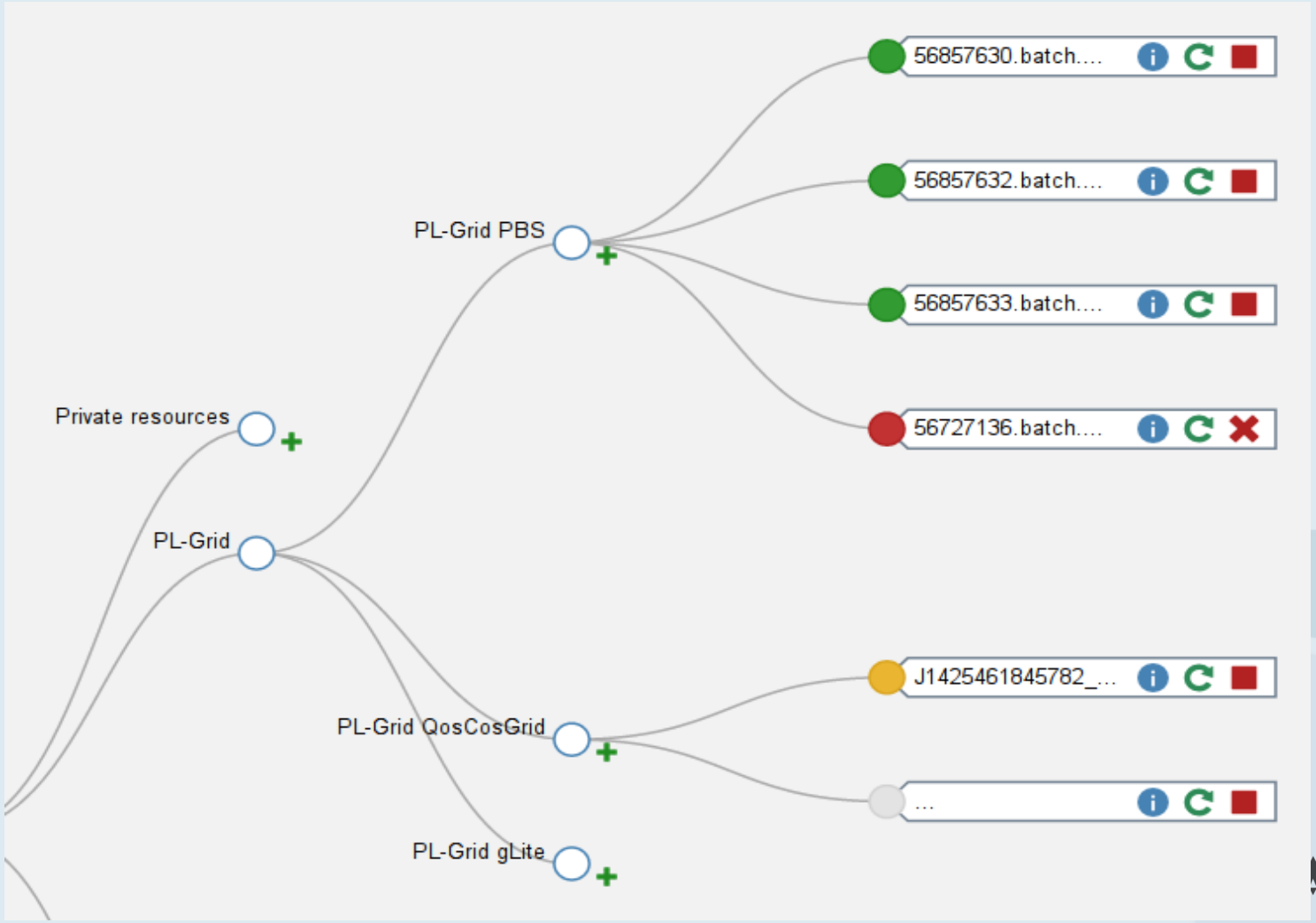

Data Farming in Scalarm Platform: Experiment Progress

Experiment progress

ALL:	78
RUNNING:	0
DONE:	58 ('74.36' % COMPLETED)
Average simulation execution time:	5 [m] 58 [s]

Experiment Speedometer

Highcharts.com

Execution progress bar

Data Farming in Scalarm Platform: Progress Information

Progress information

Show/Hide completed | Show/Hide running

Complete simulation runs

#	Execution time	Final results	Transferred energy	Amount of iterations (replication)
1	98.112 [s]	{"fitness_calls"=>72, "iemas_fitness"=>692.112086227, "time_elapsed"=>50}	0	1
2	136.69 [s]	{"fitness_calls"=>57, "iemas_fitness"=>740.62615994, "time_elapsed"=>100}	0	2
3	191.722 [s]	{"fitness_calls"=>66, "iemas_fitness"=>724.829450338, "time_elapsed"=>140}	0	3

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Data Farming in Scalarm Platform: Simulation Details

Simulation 2

Status: completed

Started at: 2015-02-25 17:25:22 UTC

Completed at: 2015-02-25 17:27:38 UTC

Input:

- **Reproduction minimum:** 0
- **Newborn energy:** 0
- **Transferred energy:** 0
- **Amount of iterations (replication):** 2
- **Immunological time span:** 1
- **Bite transfer:** 1
- **Mahalanobis similarity:** 0.8
- **Immunological maturity time:** 1
- **Good agent energy:** 1
- **Evaluation method:** rastrigin

Output:

- **fitness_calls:** 57
- **iemas_fitness:** 740.62615994
- **time_elapsed:** 100

Binary output:

click to download
File size: 685 [kB]

Simulation STDOUT:

click to download
File size: 365 [B]

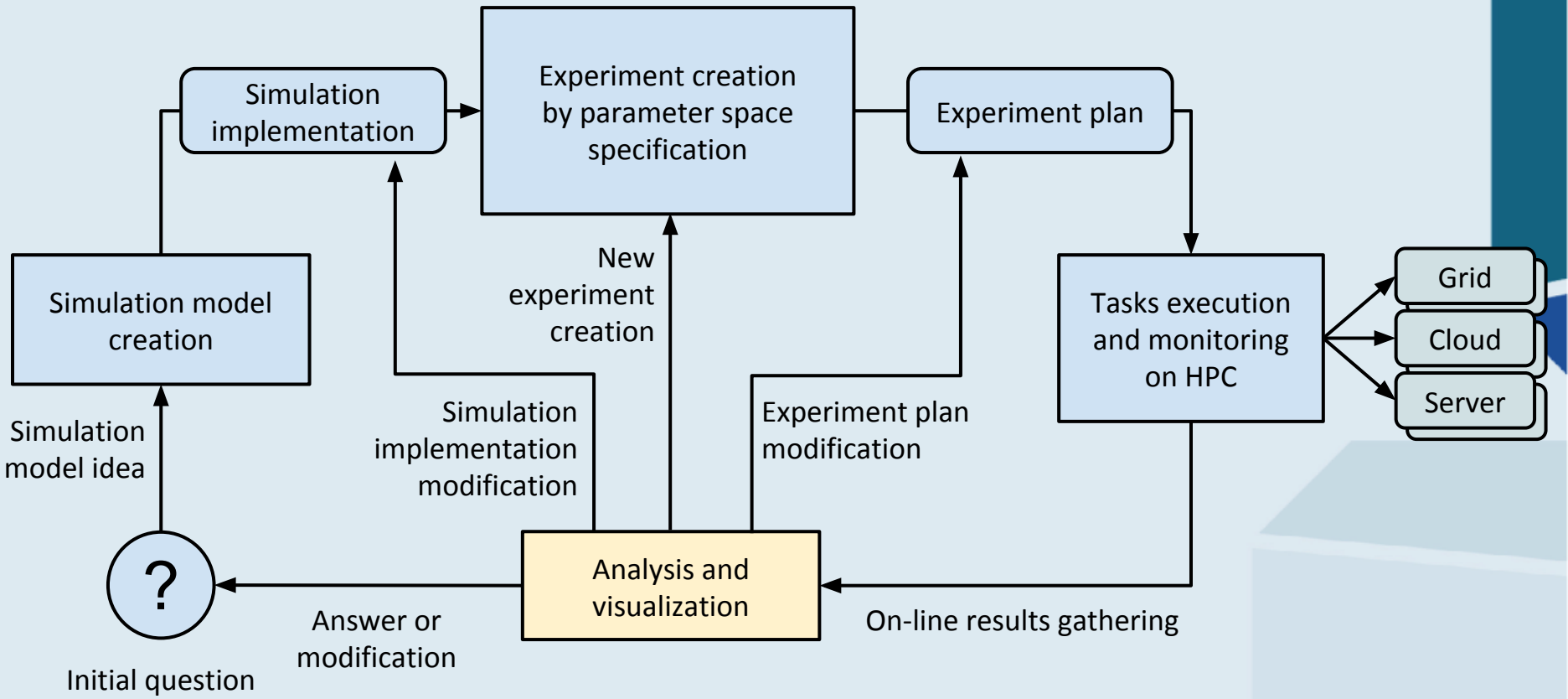
Input parameters

Measures of Effectiveness

Standard output

Binary output

Data Farming in Scalarm Platform: Analysis and Visualization



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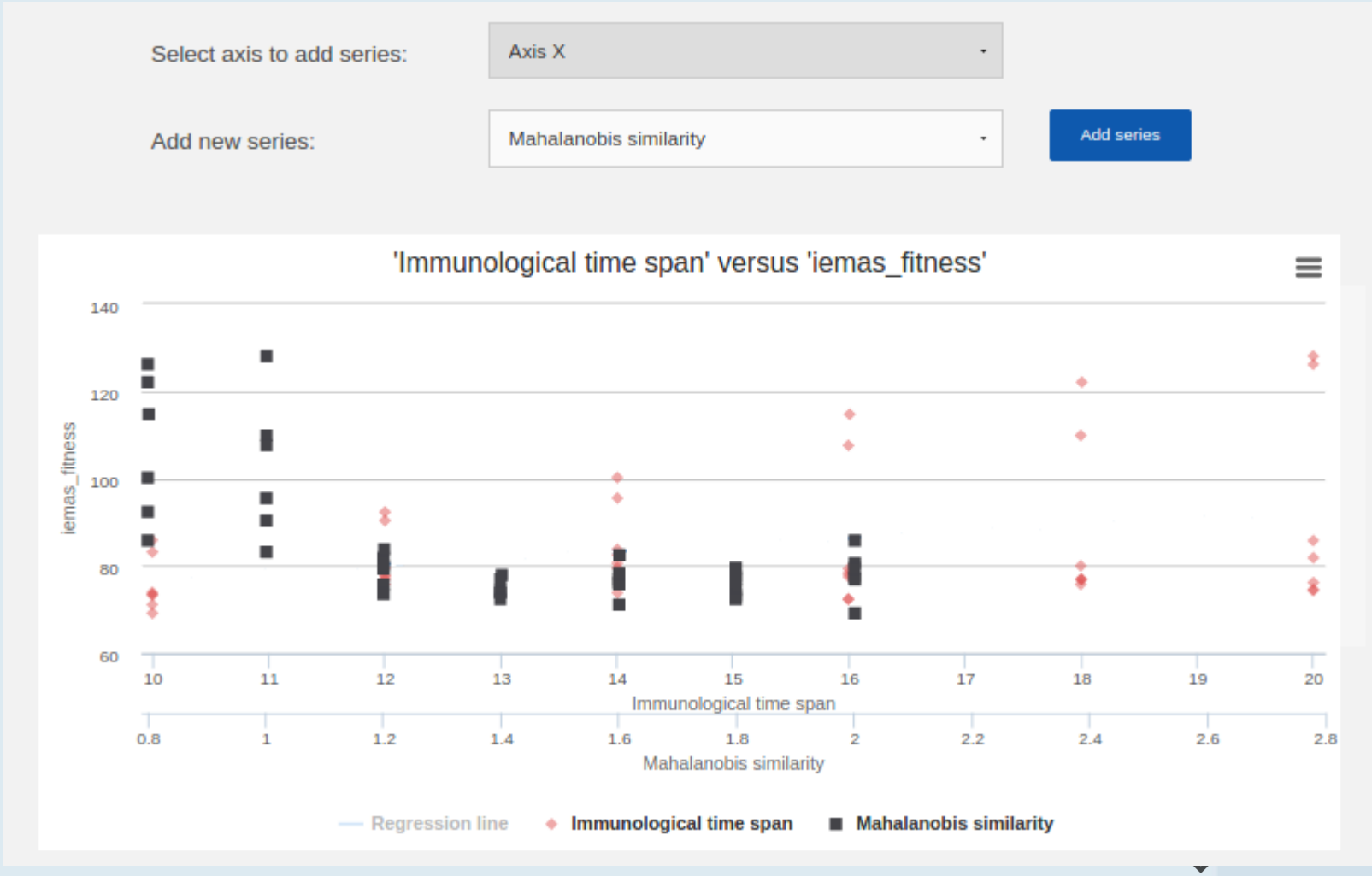

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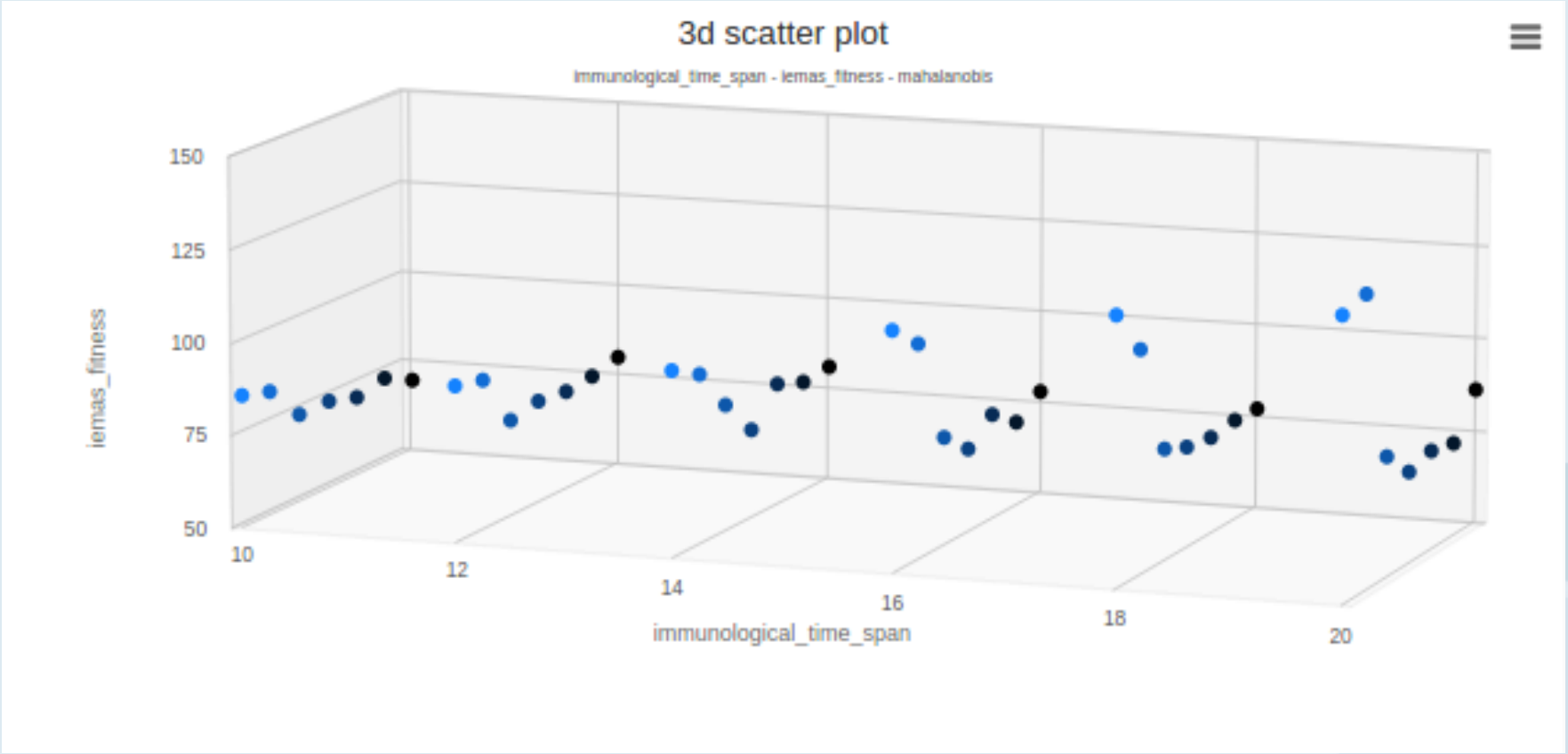

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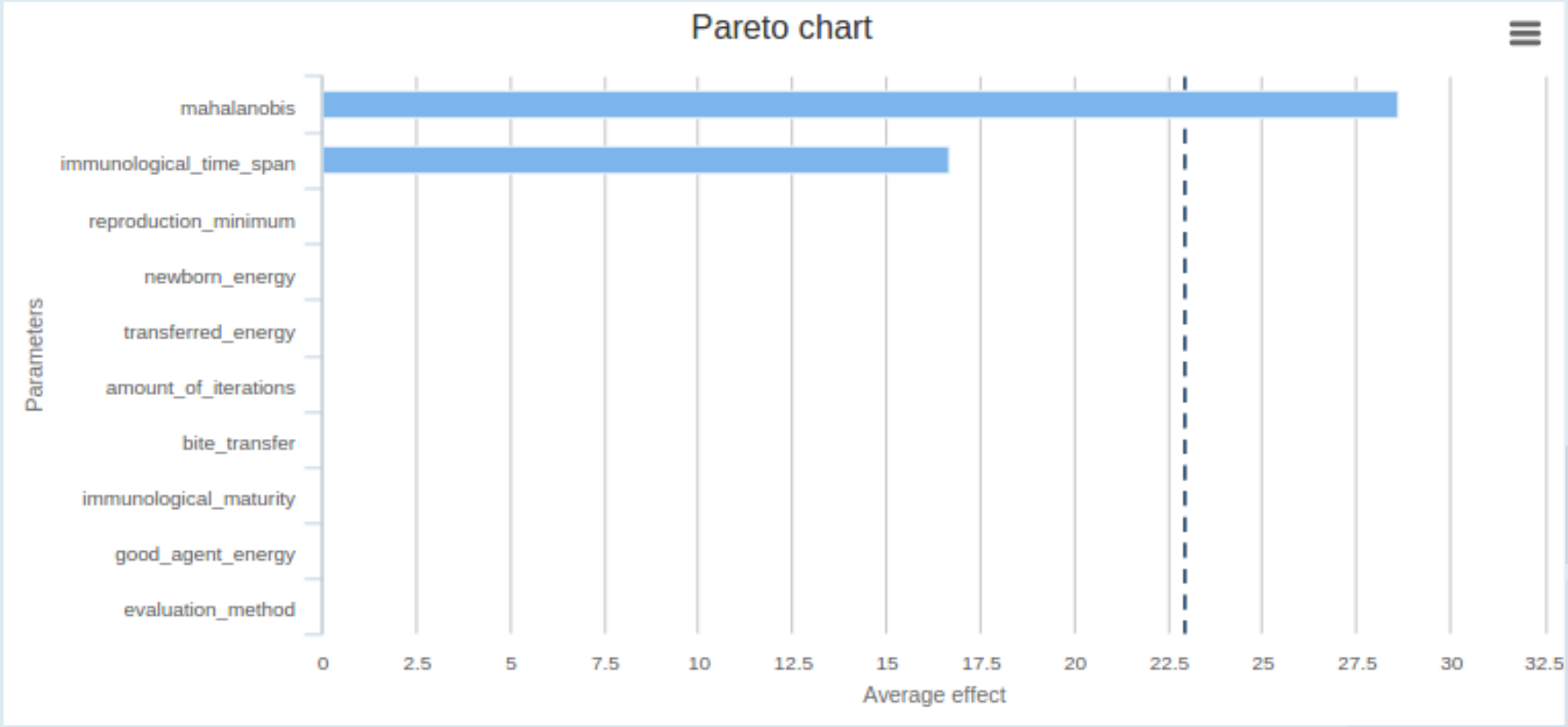

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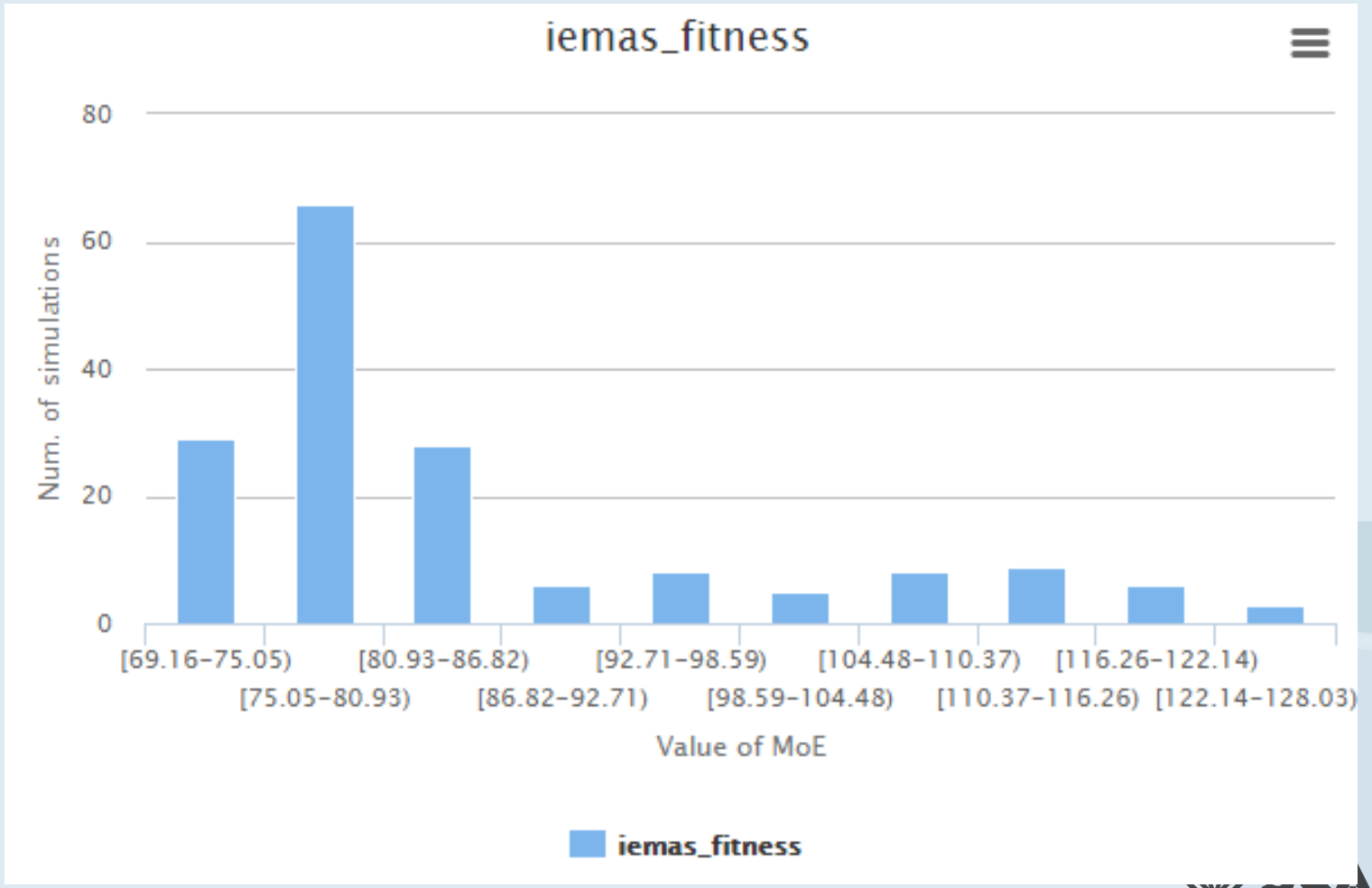

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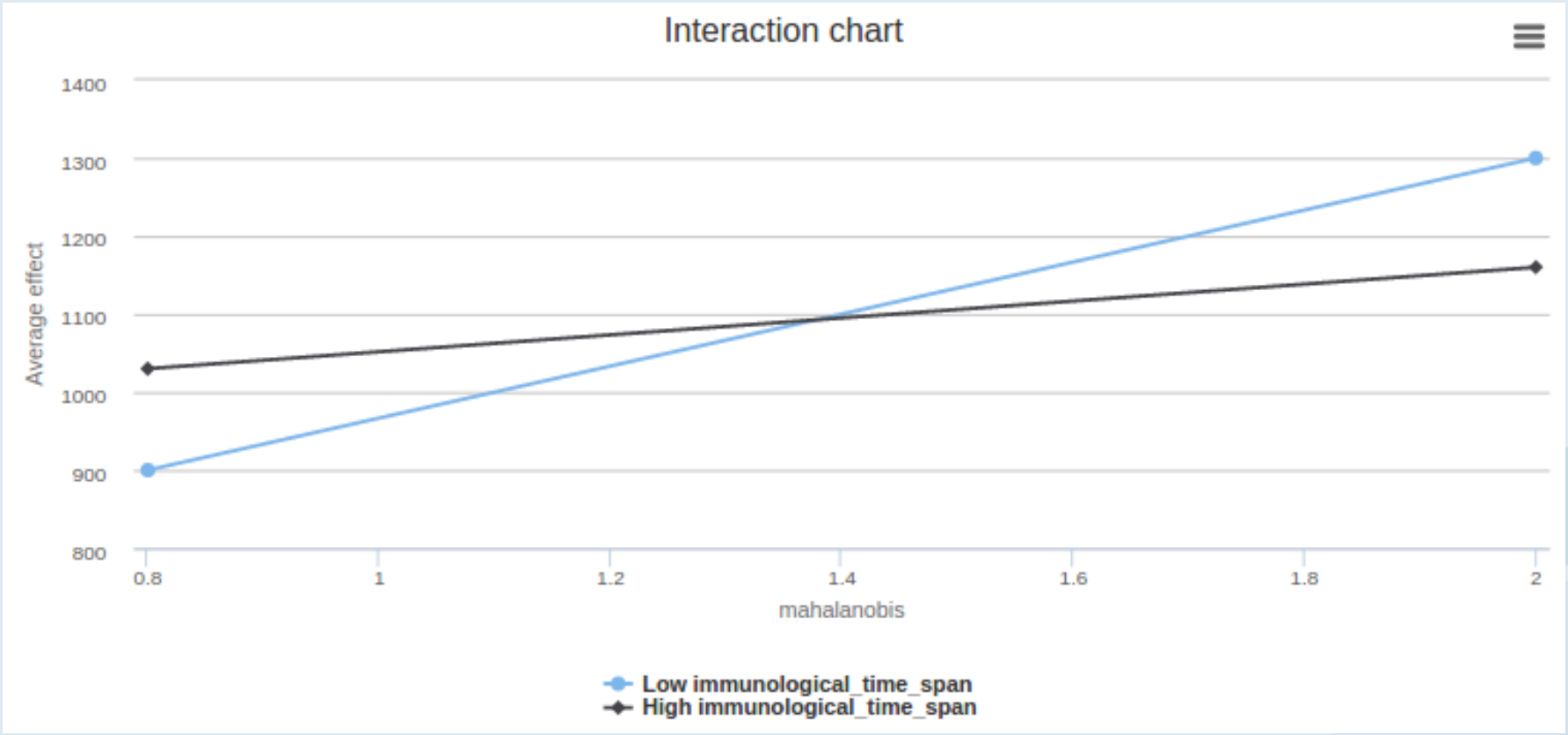

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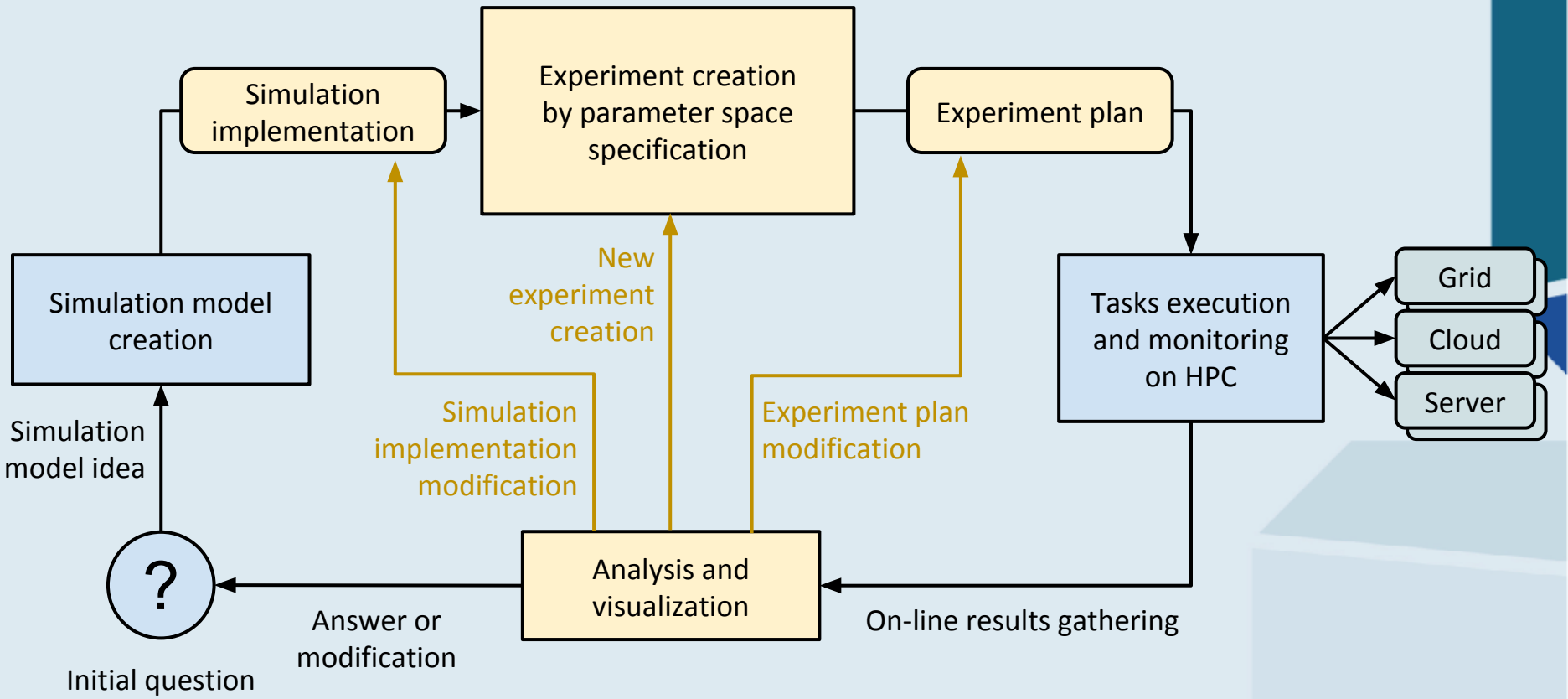
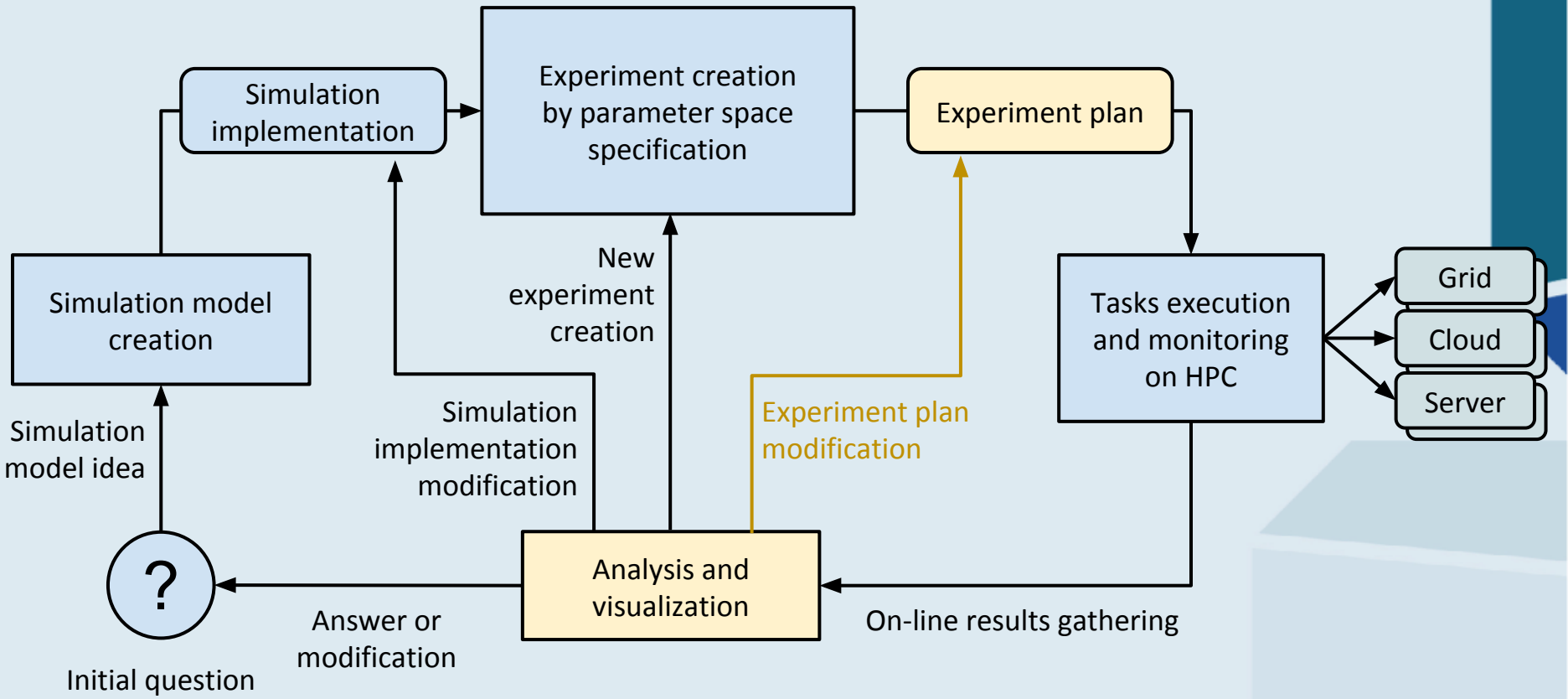


Data Farming in Scalarm Platform: Experiment Plan Modification



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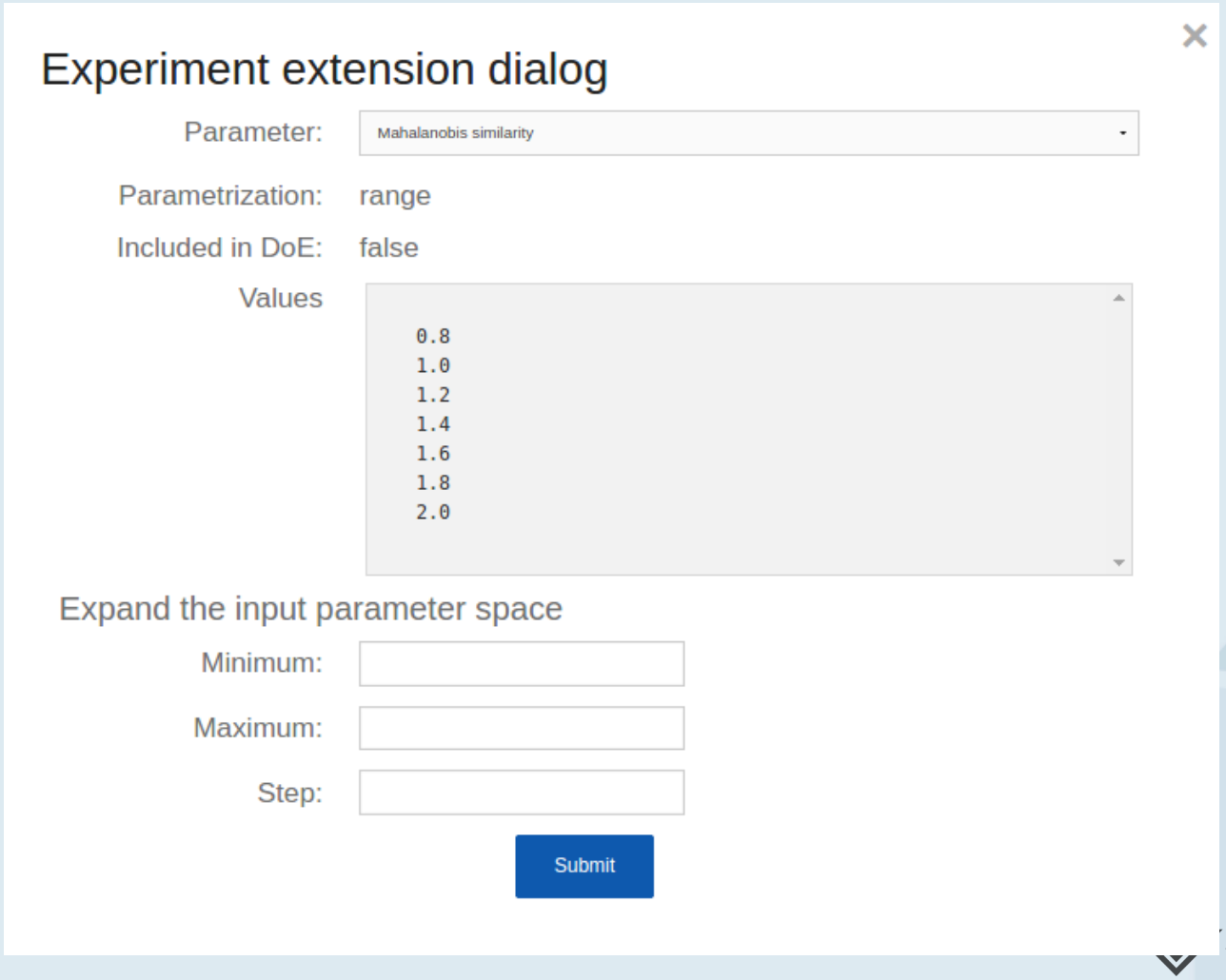
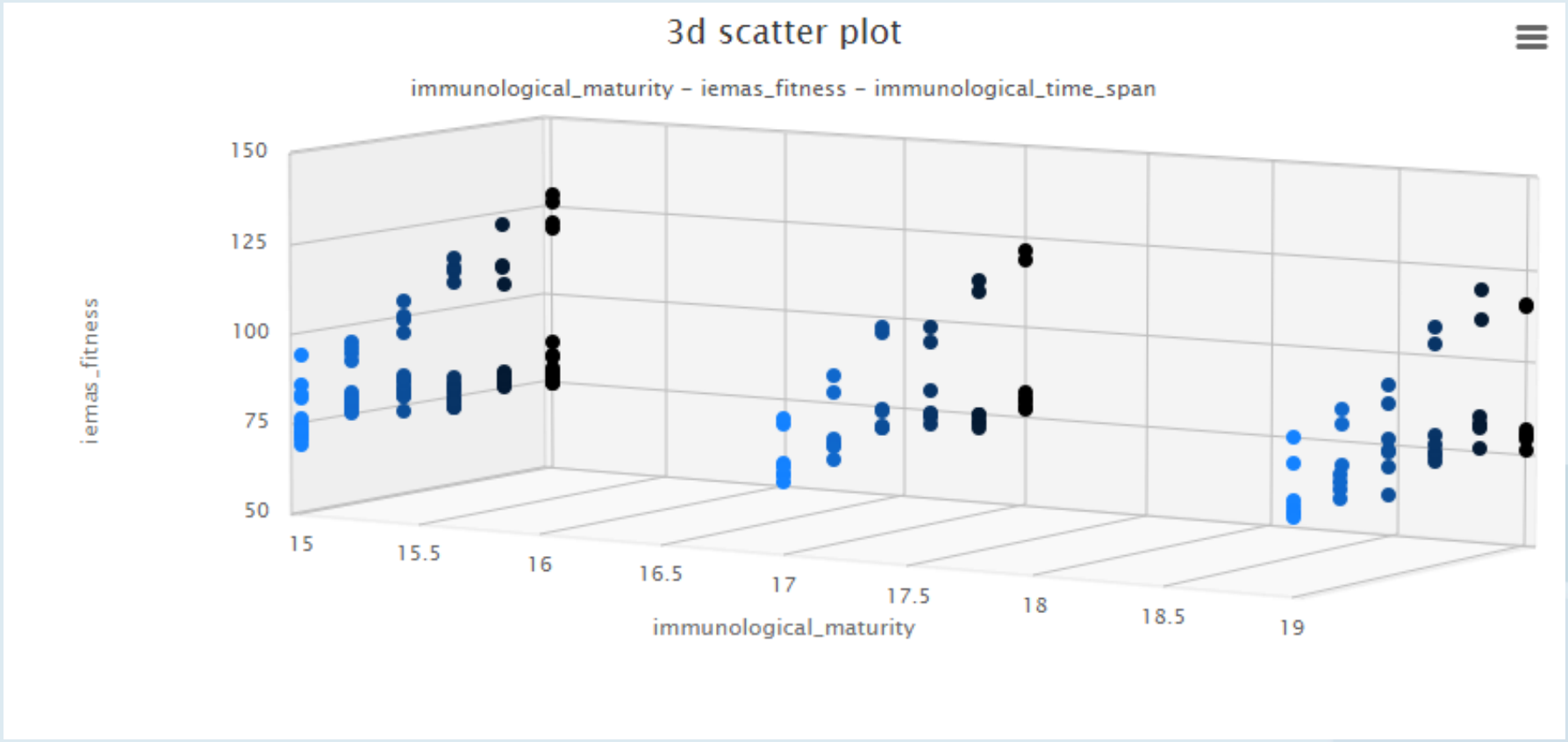


Data Farming w platformie Scalarm: Experiment Plan Modification



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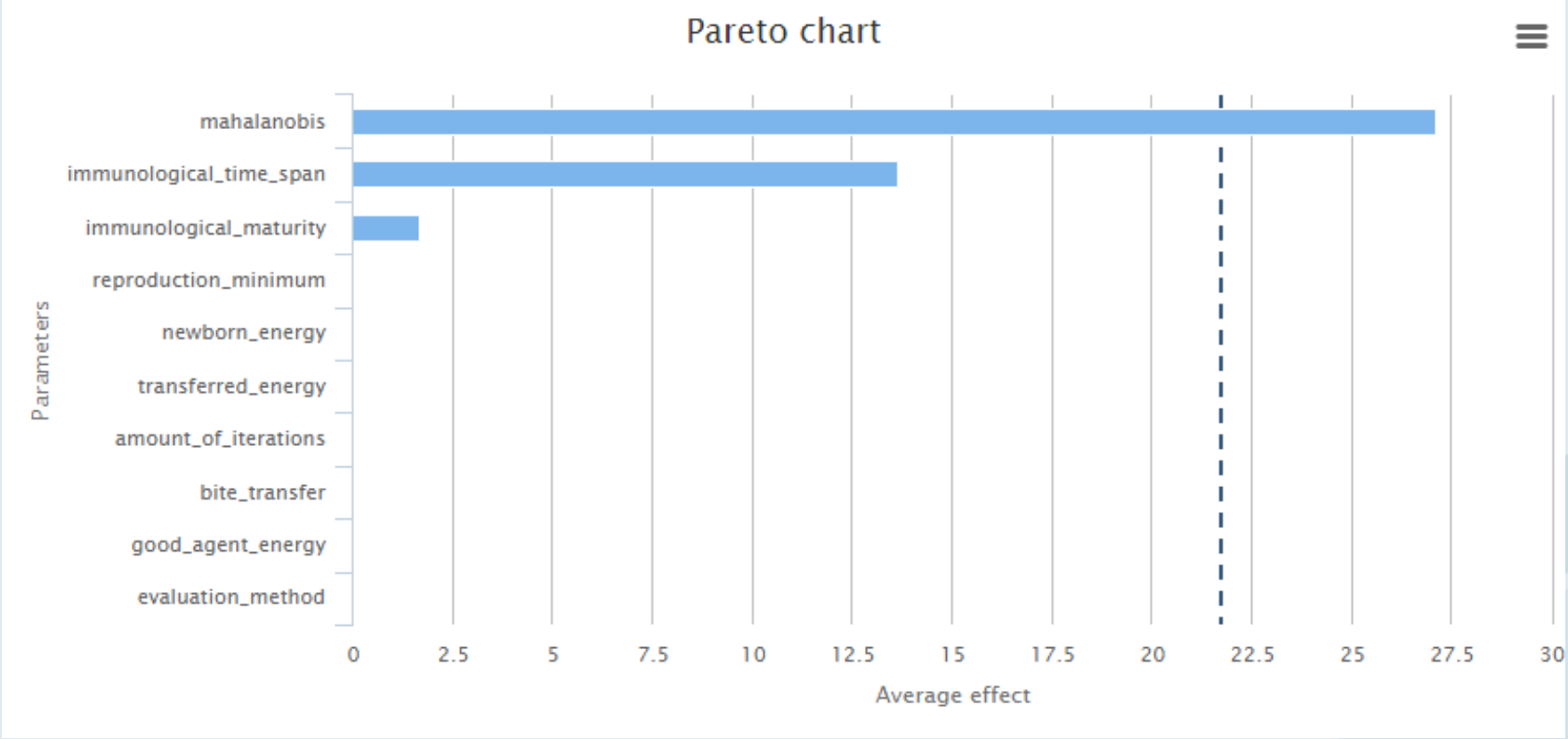

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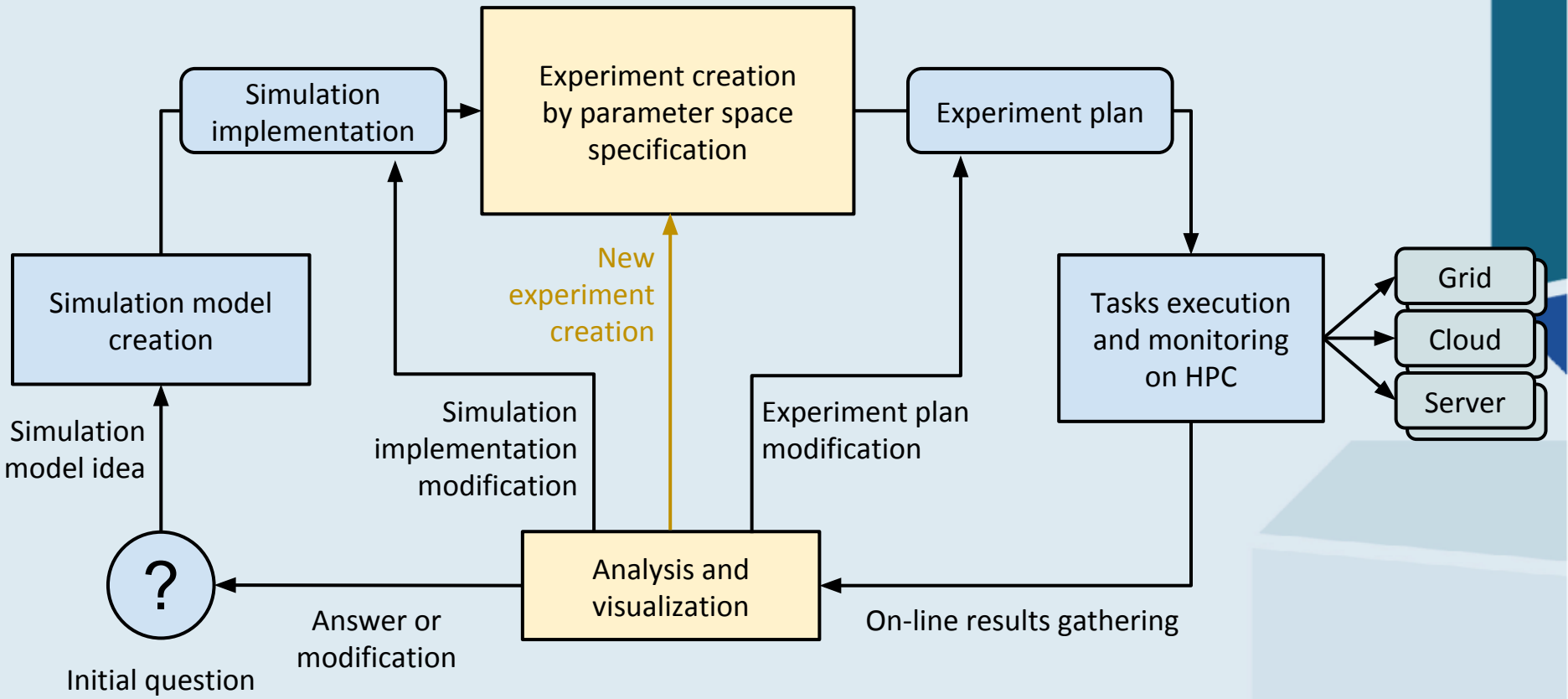
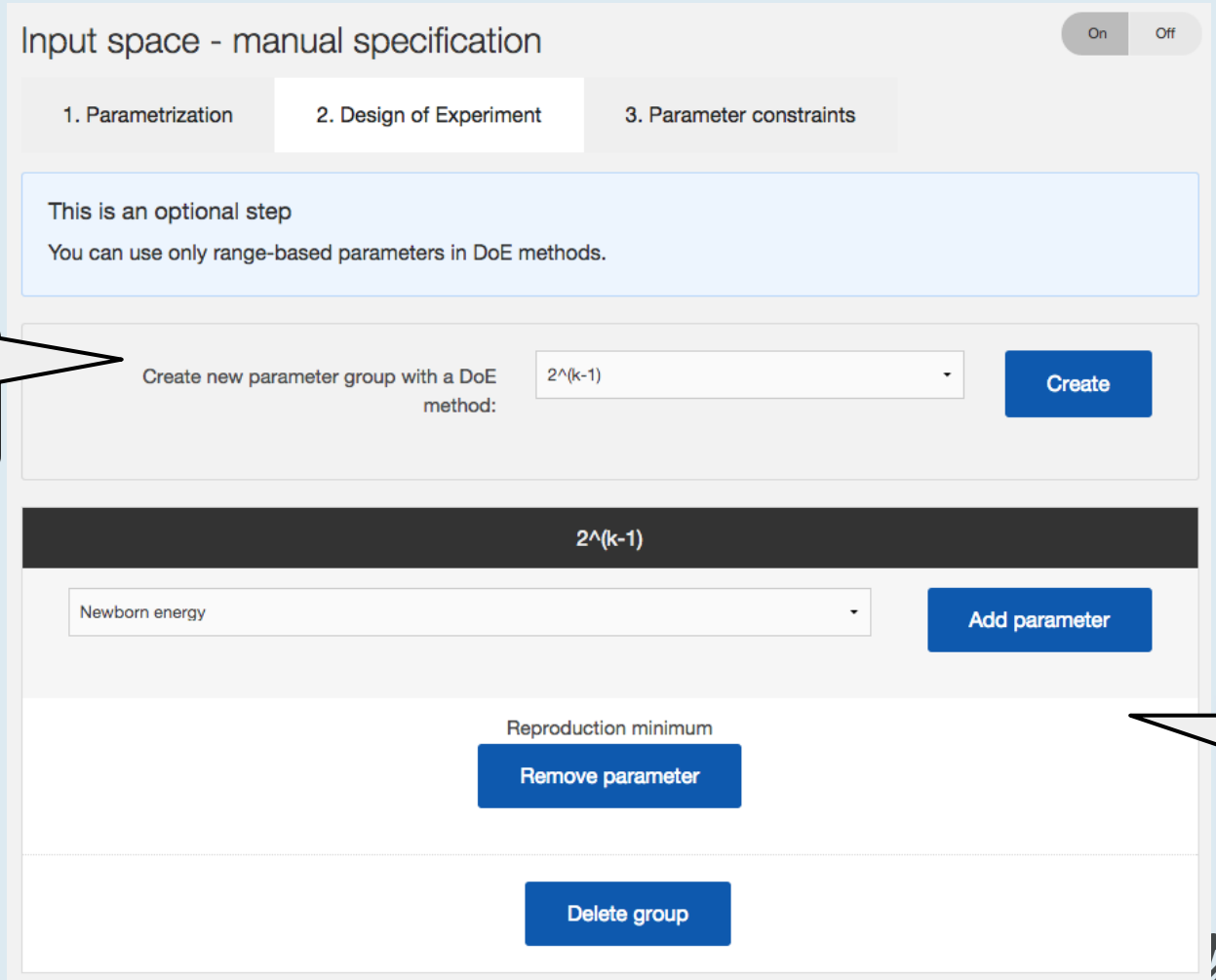
Data Farming in Scalarm Platform: New Experiment Creation



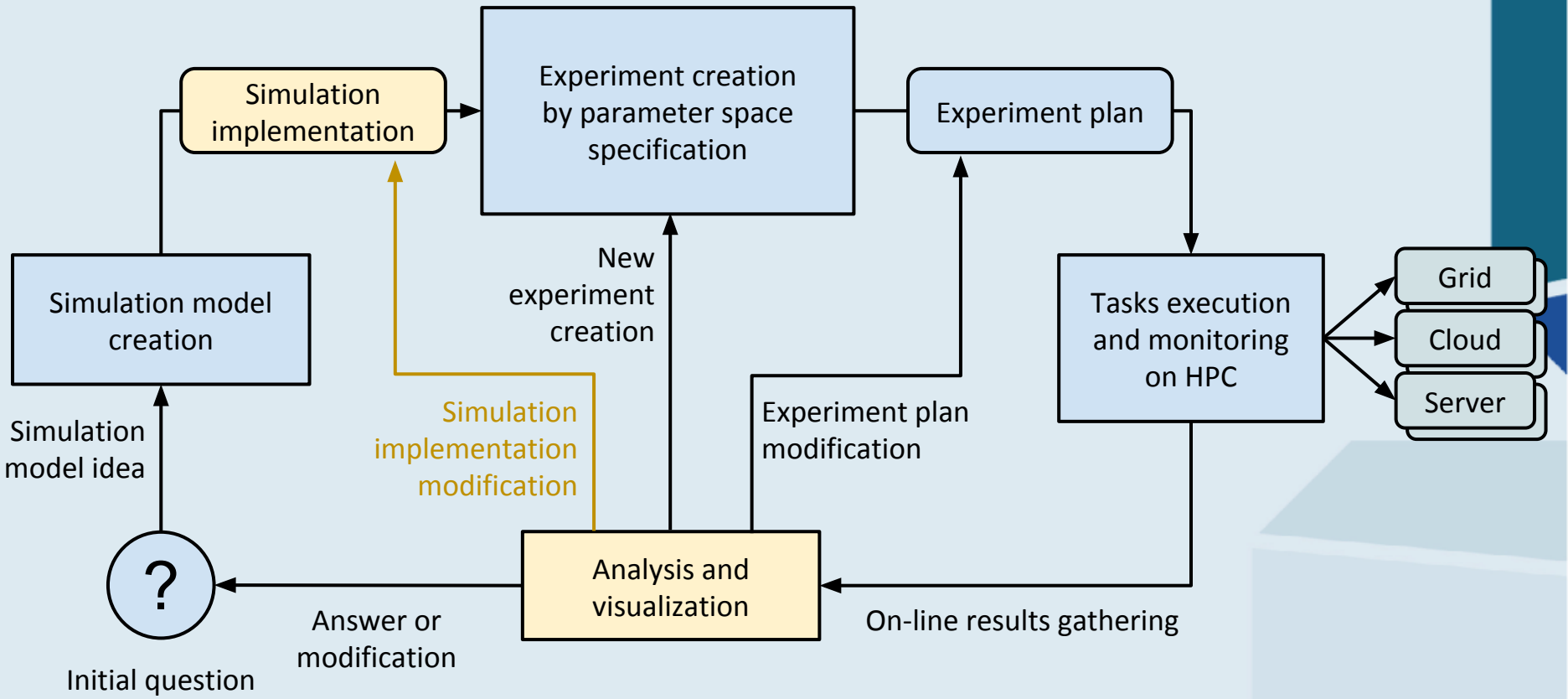
Data Farming in Scalarm Platform: Experiment Creation



Choose DoE method

Choose parameters

Data Farming in Scalarm Platform: Simulation modification



Summary

- The Scalarm Platform introduces considerable ease in parameter study and Data Farming experiments conduction
- Interactivity allows faster response for emerging results
- Scalarm can act as a middleware

https://scalarm.plgrid.pl

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Future Works

- Extension with more basic analysis and visualisation methods
- Integration with sensitivity analysis methods
  - Faculty of Metal Engineering and Industrial Computer Science, **D. Bachniak**
- Support for semi-automatic experiment plan modification

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Thank you!

https://scalarm.plgrid.pl

Contact us:

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dkrol@agh.edu.pl

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