Remote Component Environment

A success story of collaborative development and research

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Agenda

- Introduction

- Aspects of RCE
- Where does RCE come from?
- Where is RCE used meanwhile?
- How does RCE contribute to the Collaborative Approach?

- Demo: How to create a first simple workflow?
- Demo: Very First Design Phase of an Aircraft

Introduction (1)

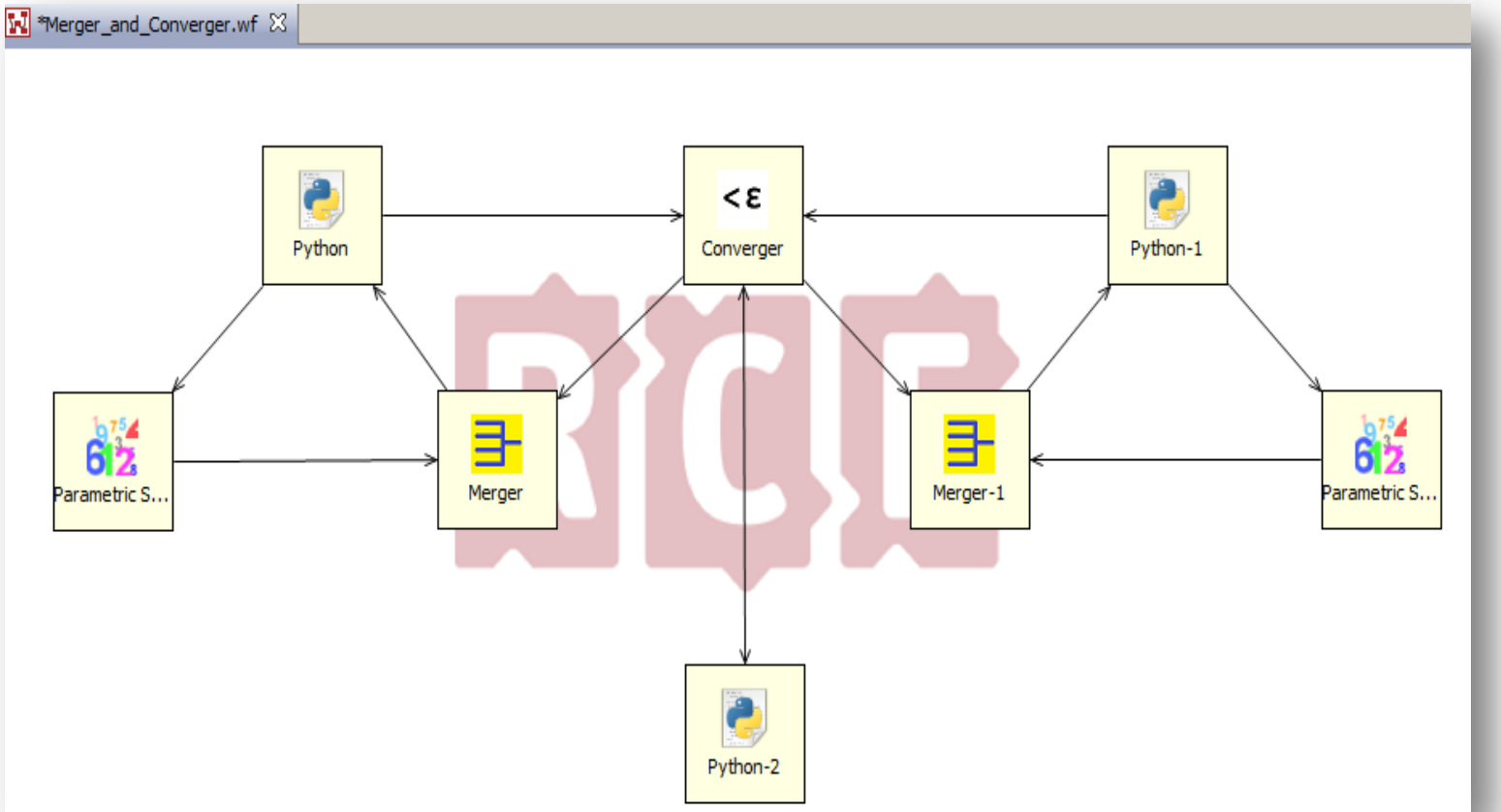
- DLR facility Simulation and Software Technology
- Team of 8 developers

- Based on Eclipse RCP, using the OSGi framework

- Create and execute workflows
- Components connected via channels to exchange data

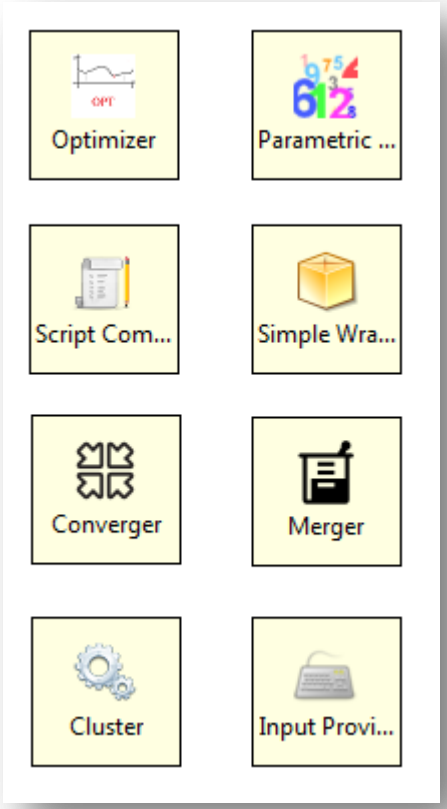
- http://rcenvironment.de/

Introduction (2)

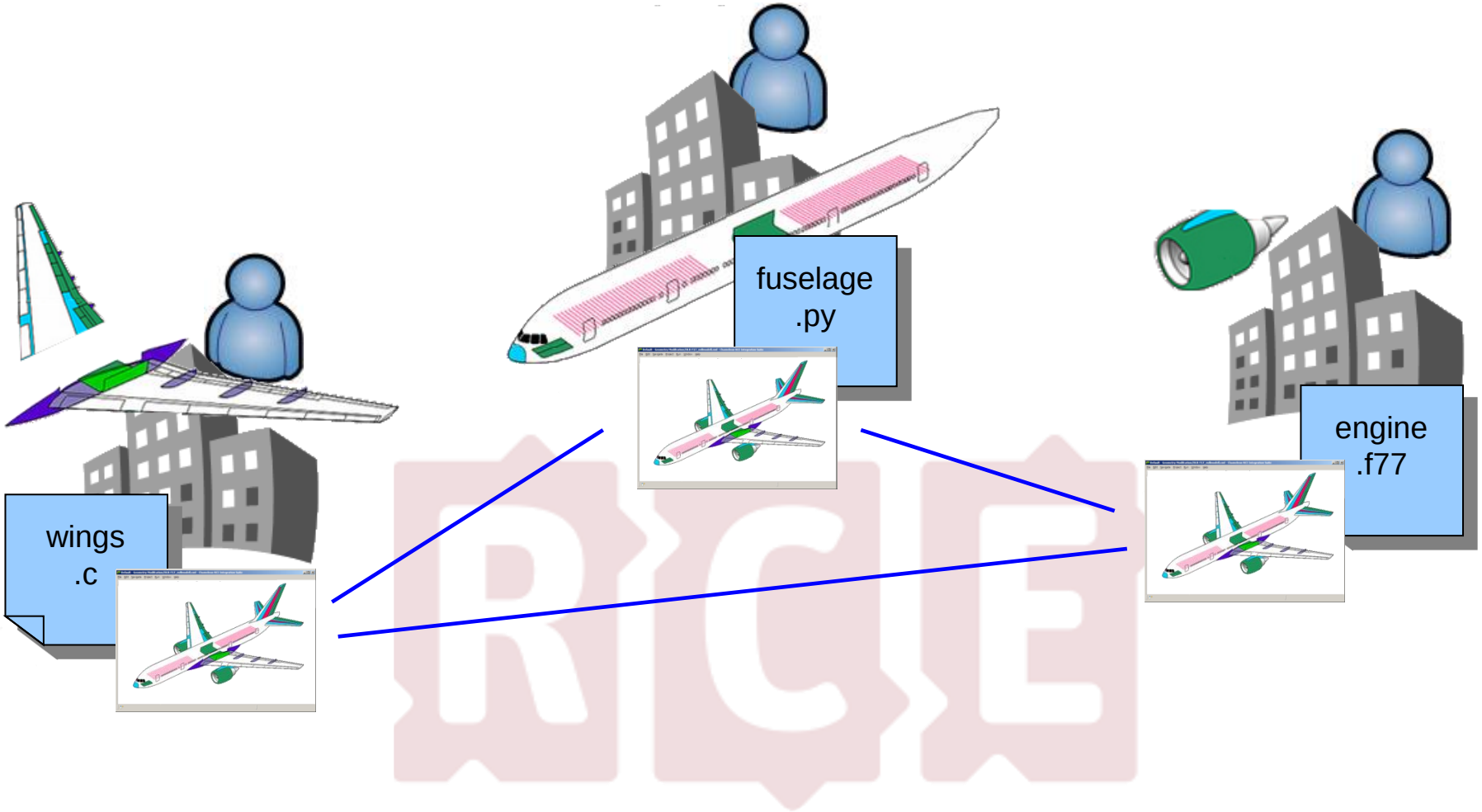


Introduction (3)

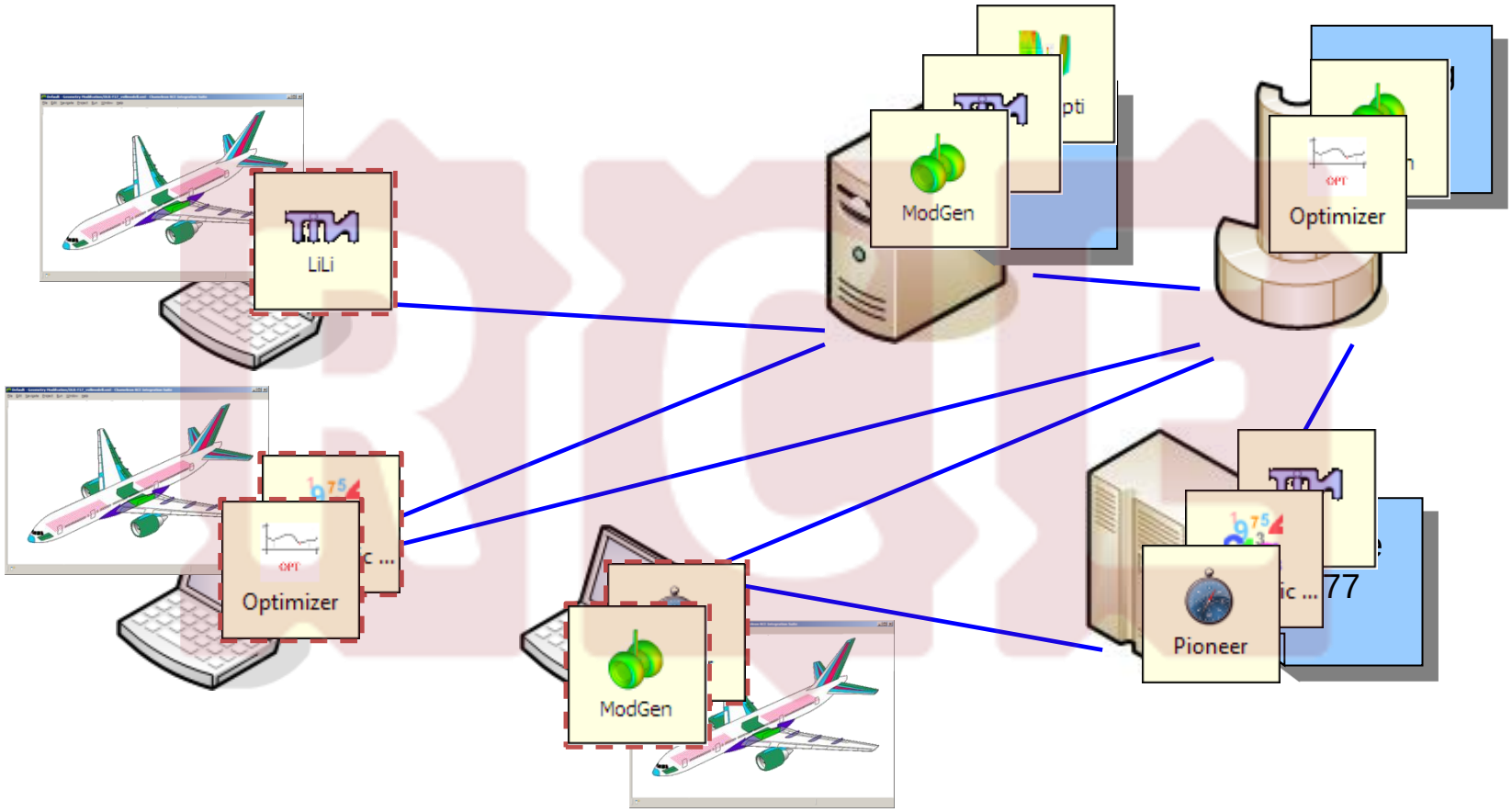
- Standard components
  - Parametric study
  - Optimizer
  - Scripts
  - Converger
  - …
- Project specific components
  - CPACS



RCE as Multidisciplinary Integration Framework

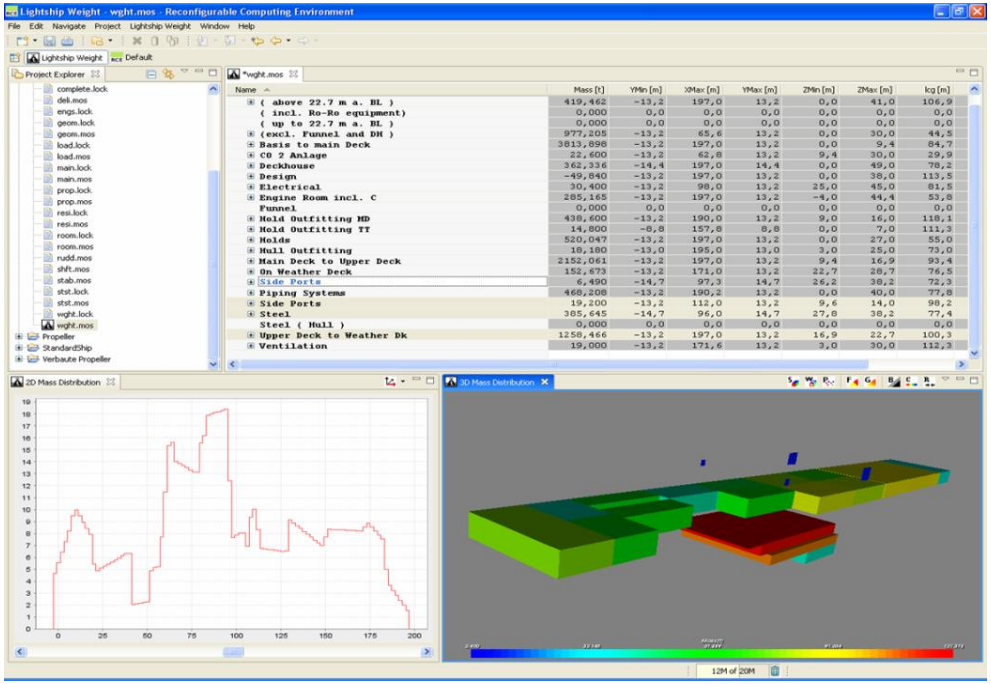


RCE as Distributed Environment



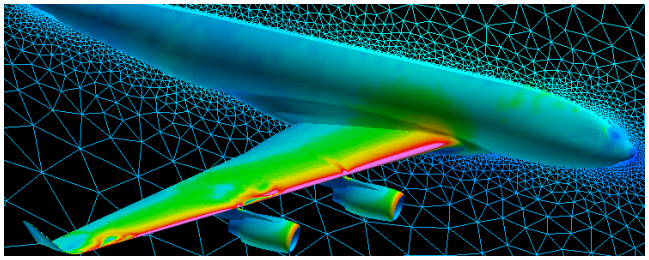
Where does RCE come from?

- Developed in a shipbuilding project (2005 – 2009)
- Simulation environment for the early design of ships
- Currently in use at Flensburger Schiffbaugesellschaft (FSG)

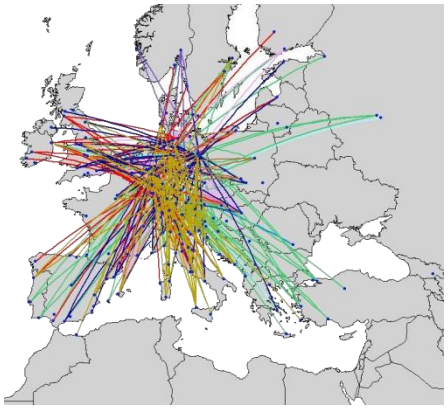


Where is RCE used meanwhile? (1)

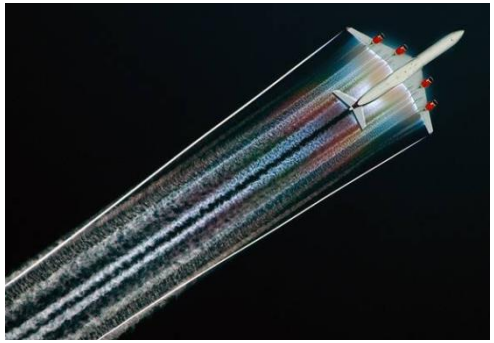
- Aircraft design



- Integrated modelling of airtraffic

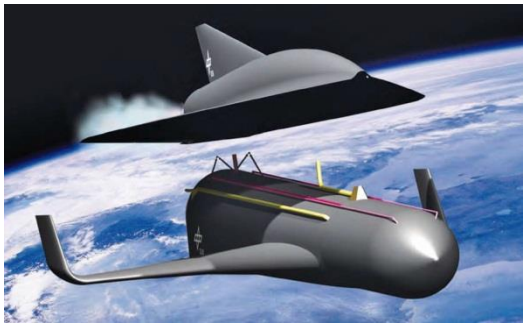


- Impact of trajectories on the climate

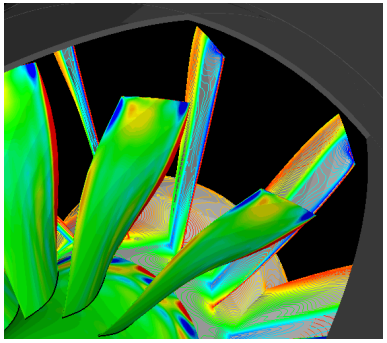


Where is RCE used meanwhile? (2)

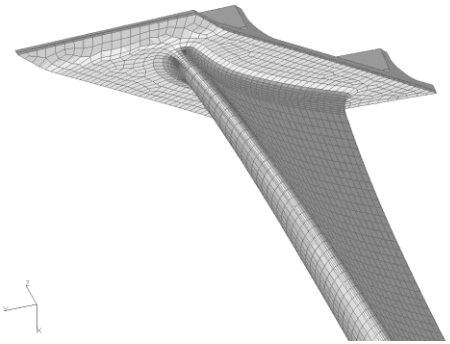
- Optimization of the thermal management of space gliders



- Engine design



- Optimization of low-pressure turbine blades under casting property constraints



How does RCE contribute to the Collaborative Approach? (1)

- Integrated framework
  - Minimal communication overhead
  - Continuous and robust tool synchronization
- Efficient and iterative process chain development
- Frequent evolution → Quick bugfixing
- Platform independent
- Open Source
- Integrated tools can have separate licenses

How does RCE contribute to the Collaborative Approach? (2)

- Worldwide cooperation
  - On-demand network between instances of RCE
  - Tools are not distributed → Developer has control
- Users and developers hand in hand
  - Components inspired by users, while remaining universal
  - External component writers are invited

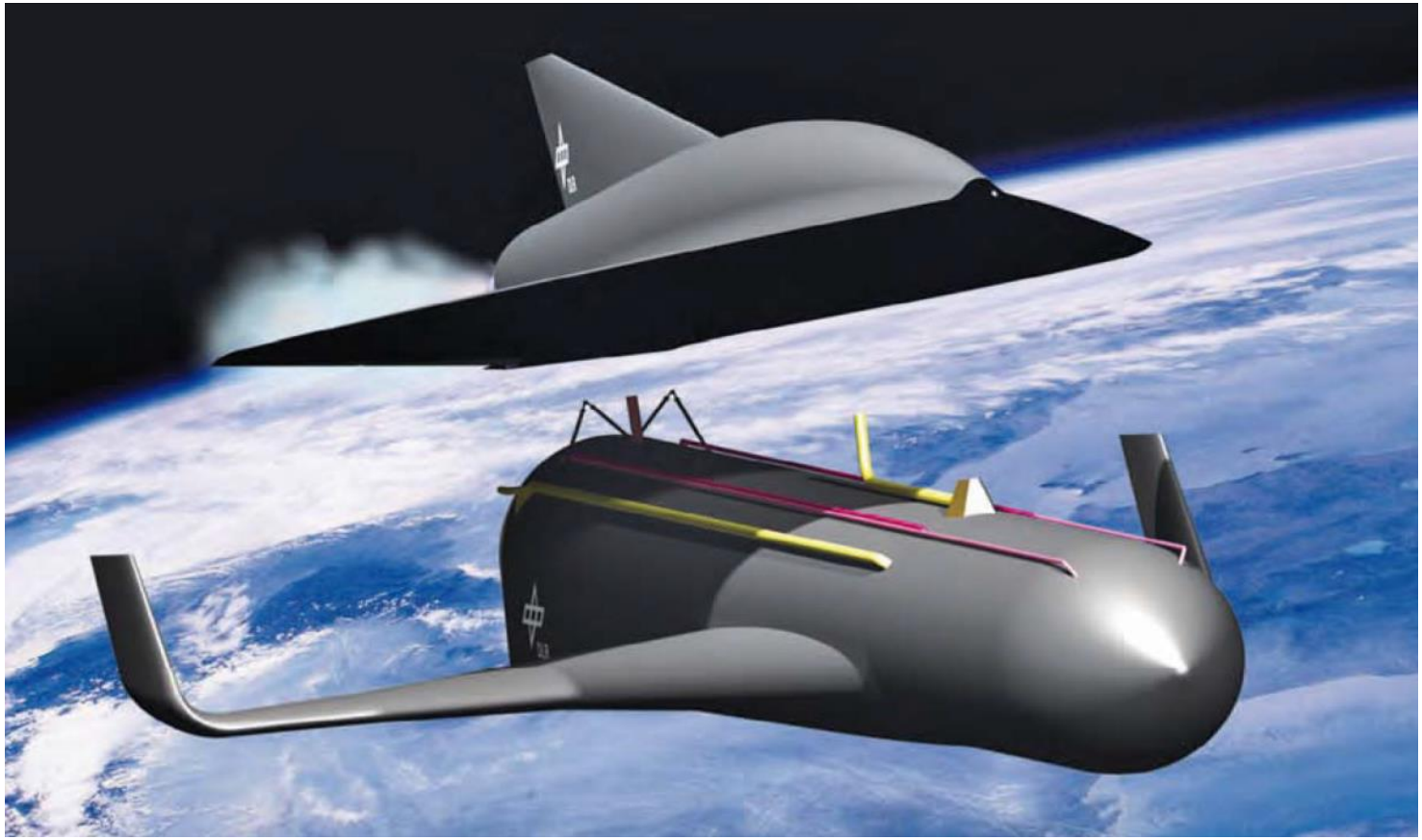
Demo: How to create a first simple workflow?

- Parametric study and Python component

- Parametric study generates numbers
- Python component processes and returns them

- Results can be visualized

Application: Very First Design Phase of an Aircraft



DLR

Application: Very First Design Phase of an Aircraft

- Goal: Find a design with maximum glide within the given contraints
- Various disciples brought together:
  - Geometry (length, nose radius)
  - Aerodynamics (lift, drag)
  - Thermal-management (cooling system)
  - Structural sizing (structural masses)
- Experts write/configure simulation tools for their domain
- RCE connects these components
- Results converge to an optimized design

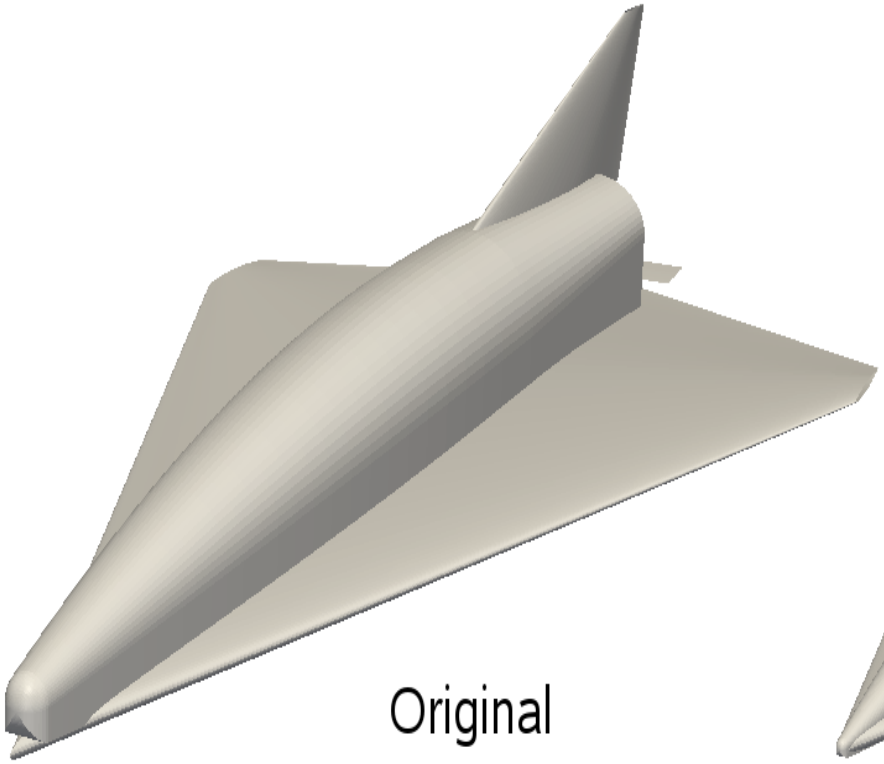
Demo: Very First Design Phase of an Aircraft

- Workflow for the very first design phase of an aircraft

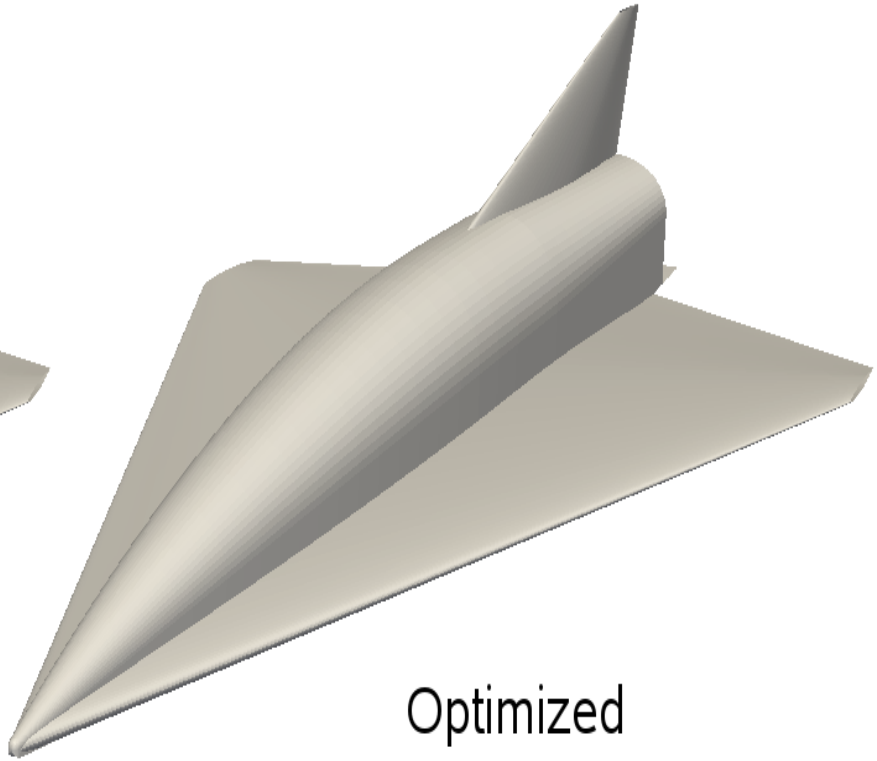
- 3 hours for convergence
- Thus: only 2 iterations → ca. 2 minutes

- Rendered results: next slide

Demo: Very First Design Phase of an Aircraft



Original



Optimized