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/](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
Application: Very First Design Phase of an Aircraft

• Goal: Find a design with maximum glide within the given constraints

• 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