Designing Future Aircraft with Eclipse RCP

EclipseCon France 2014

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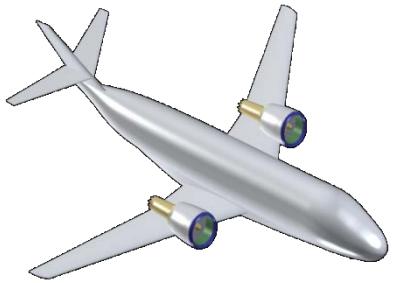
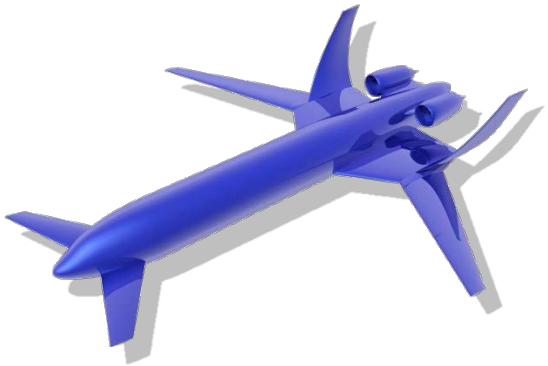
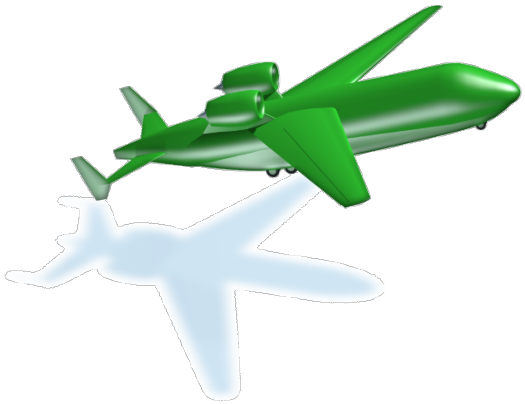
DLR

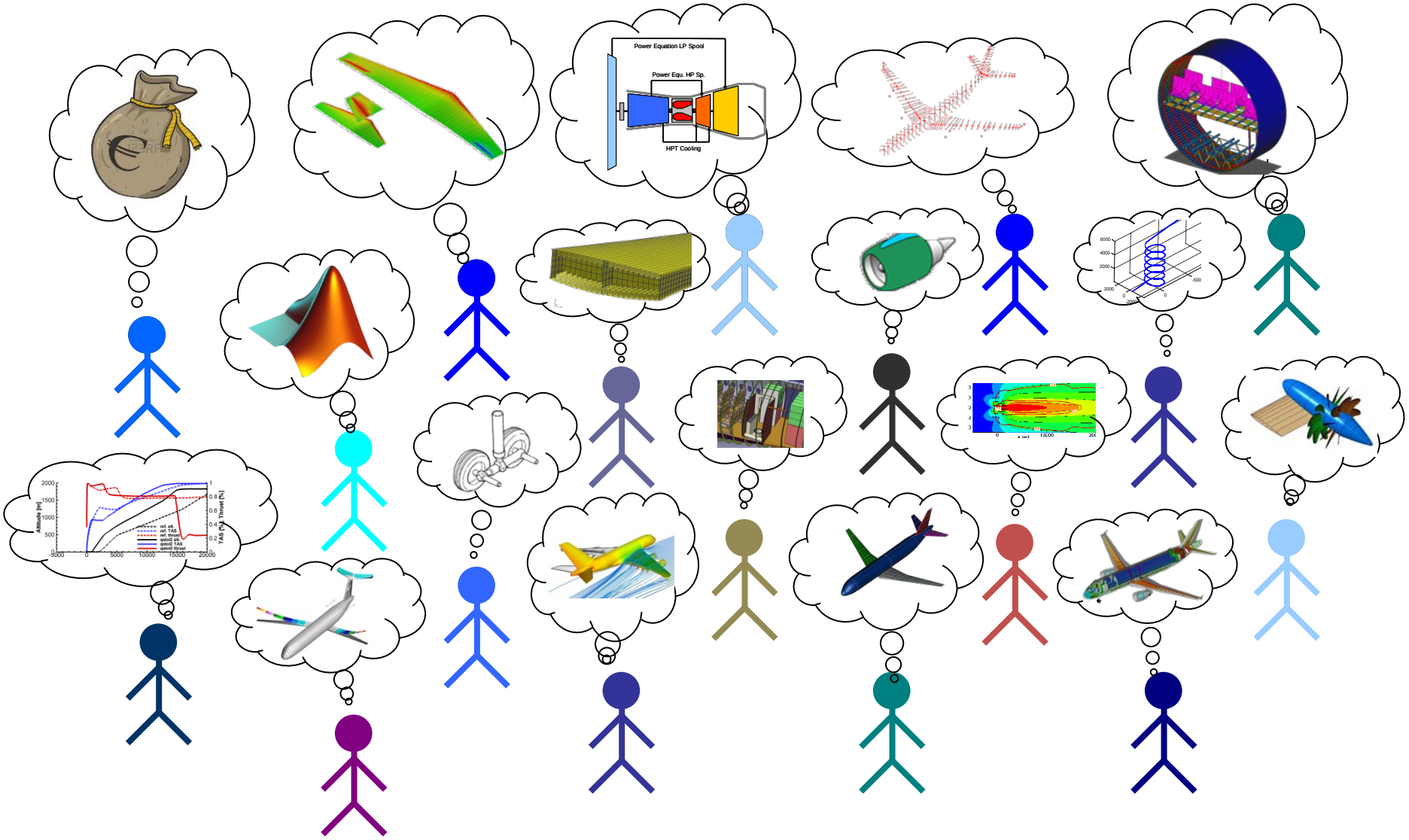
Future Aircraft Design

- Get new aircraft configurations which
  - are more environment-friendly
  - require less operating costs









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RCE: Software for Future Aircraft Design

- DLR (German Aerospace Center) develops software for future aircraft design called RCE (Remote Component Environment)
- RCE enables multidisciplinary collaboration to help experts from different disciplines to solve overall aircraft design task in common
- We built RCE on Eclipse RCP and made it open source (EPL)

RCE

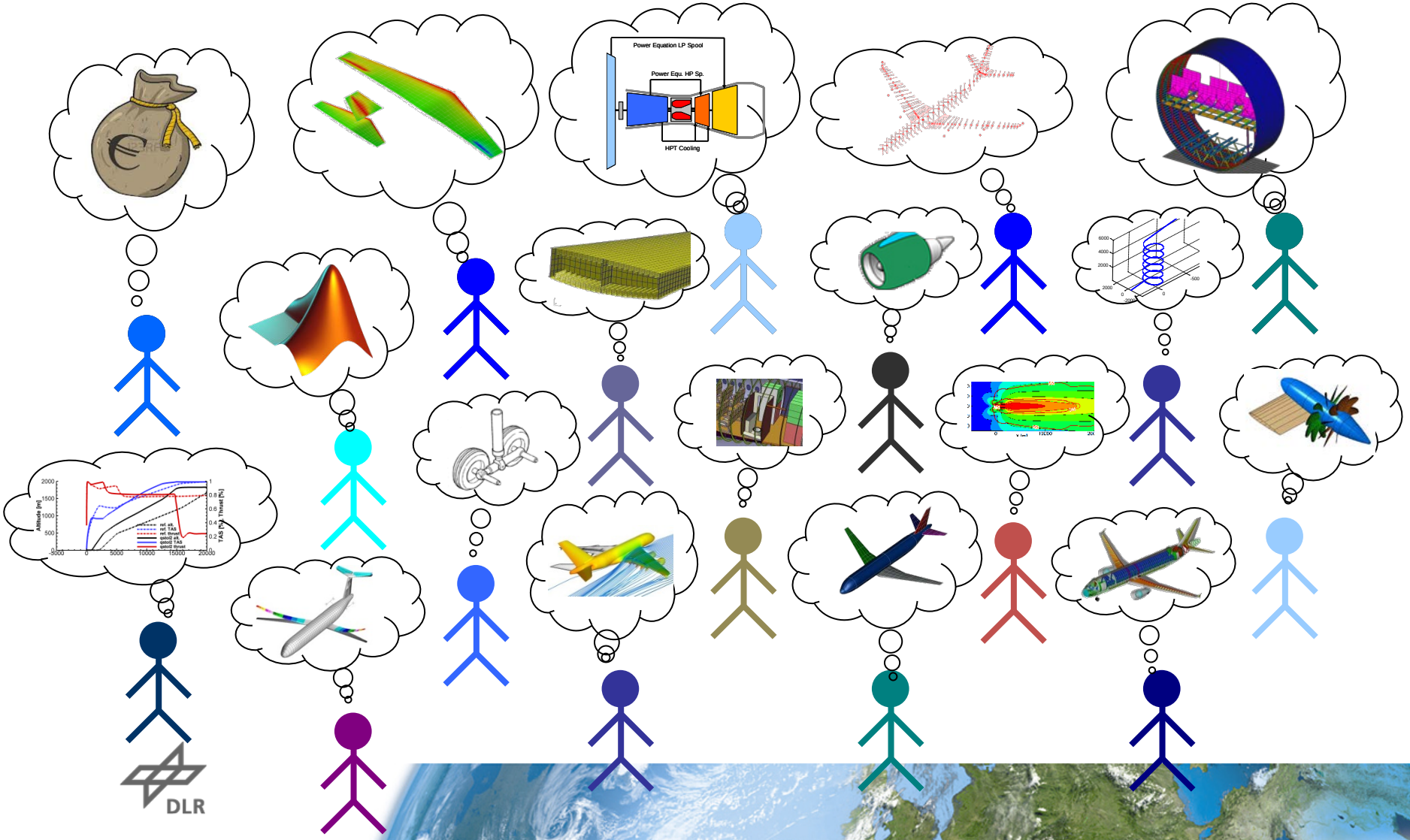
Outline

- Short introduction of RCE
- Selected aspects of RCE regarding Eclipse RCP
  - Modularity
  - Usability
  - Distribution management
- Example projects at DLR using RCE

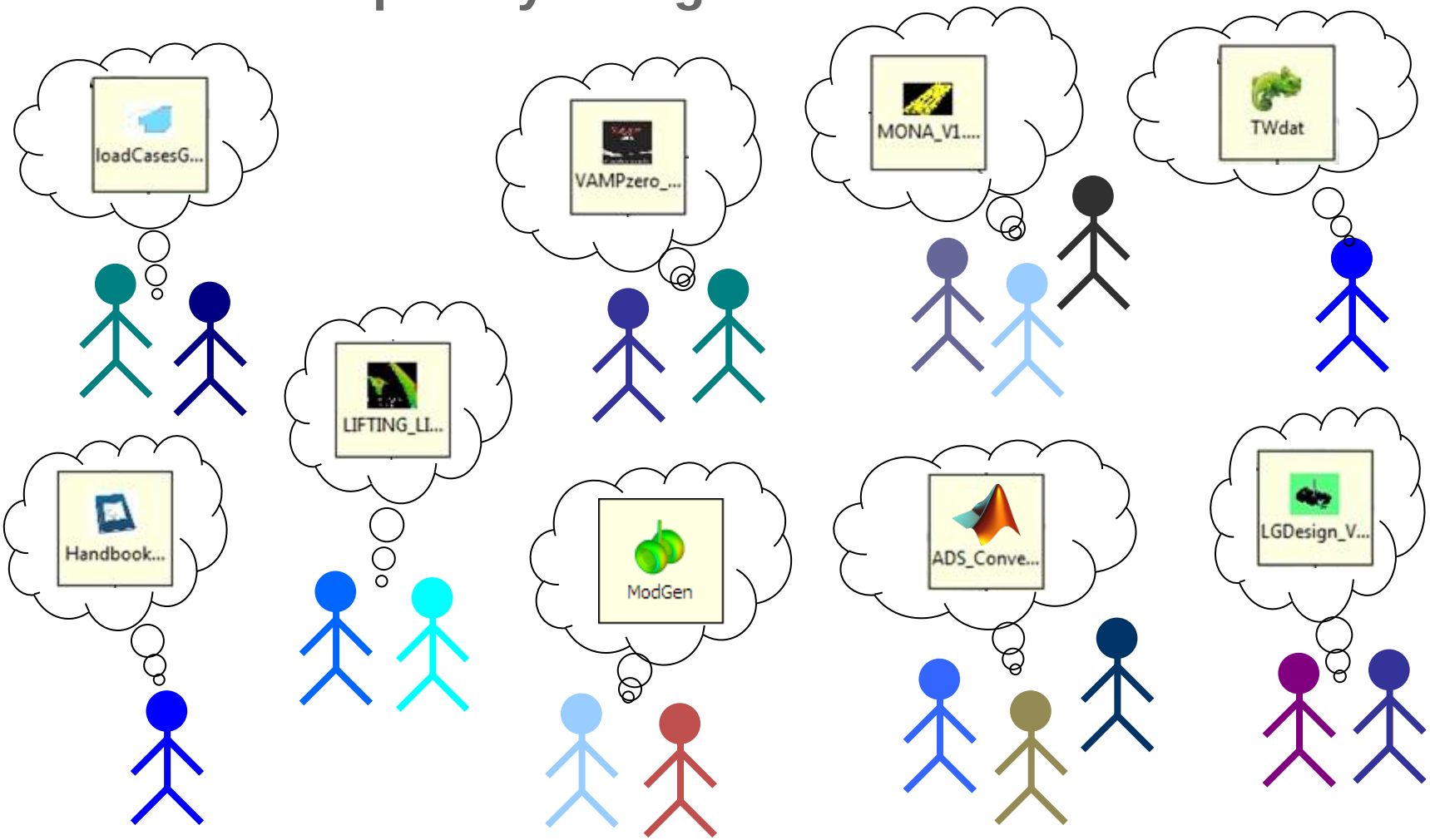
Why Eclipse RCP?

- Decision was made in 2006 as the development of RCE had started
- Reason was (mainly) OSGi, providing a component model, which
  - Sounded promising
  - Was standardized
- On a second note, it was important that basic „stuff“ can be re-used and is not implemented from scratch

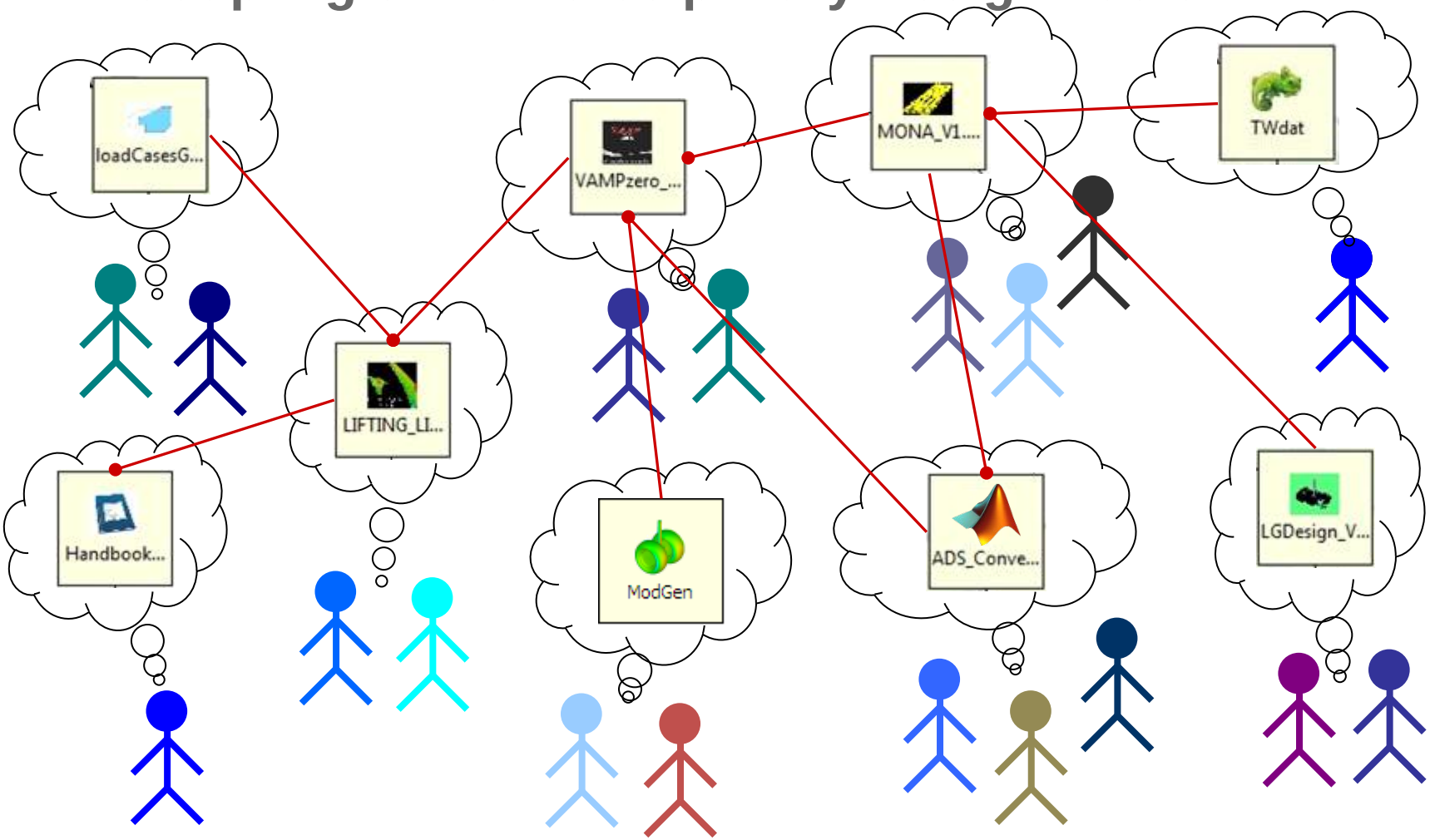
Multidisciplinary Design



Multidisciplinary Design Tools



Coupling of Multidisciplinary Design Tools



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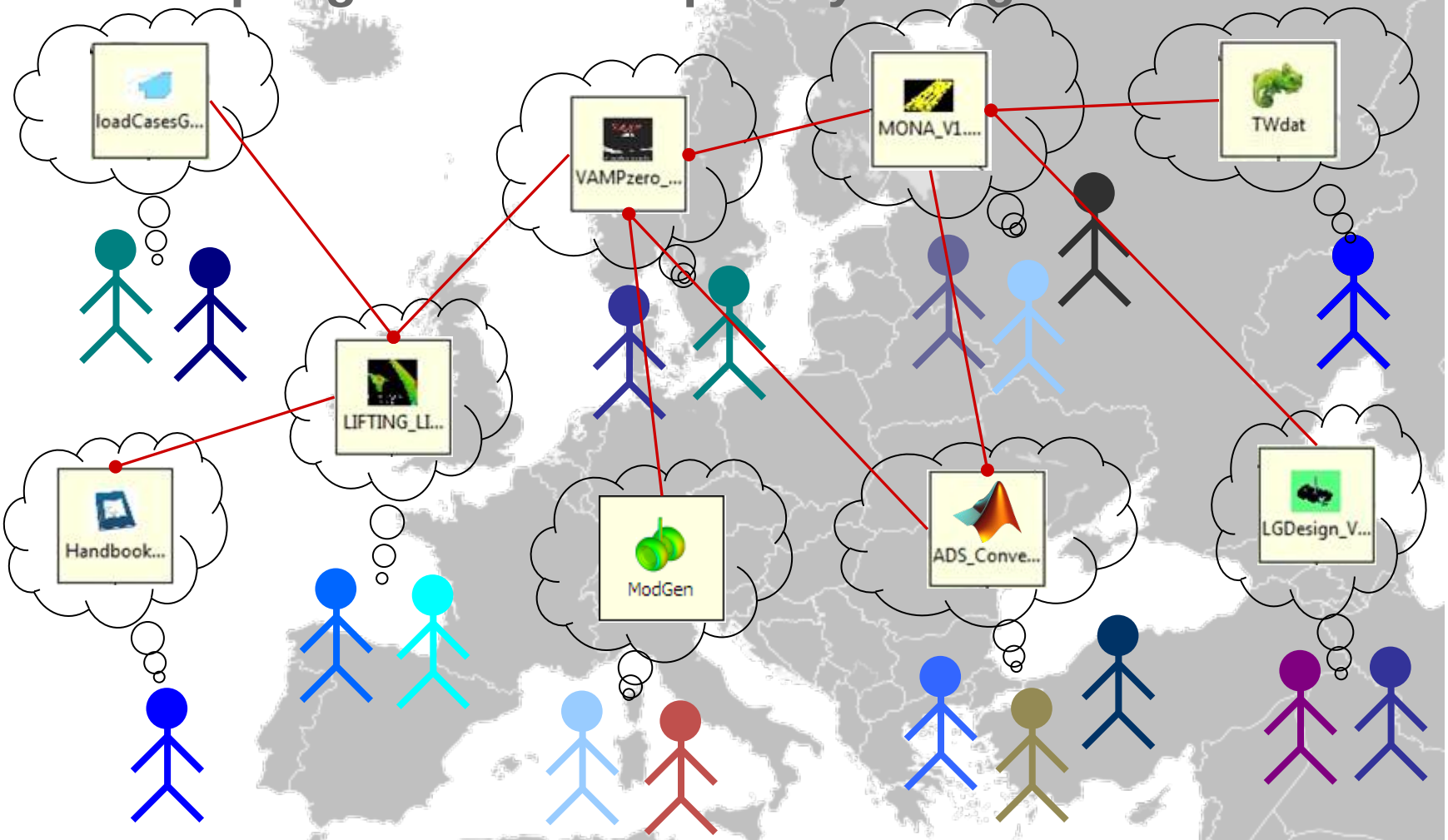
Coupling of Multidisciplinary Design Tools



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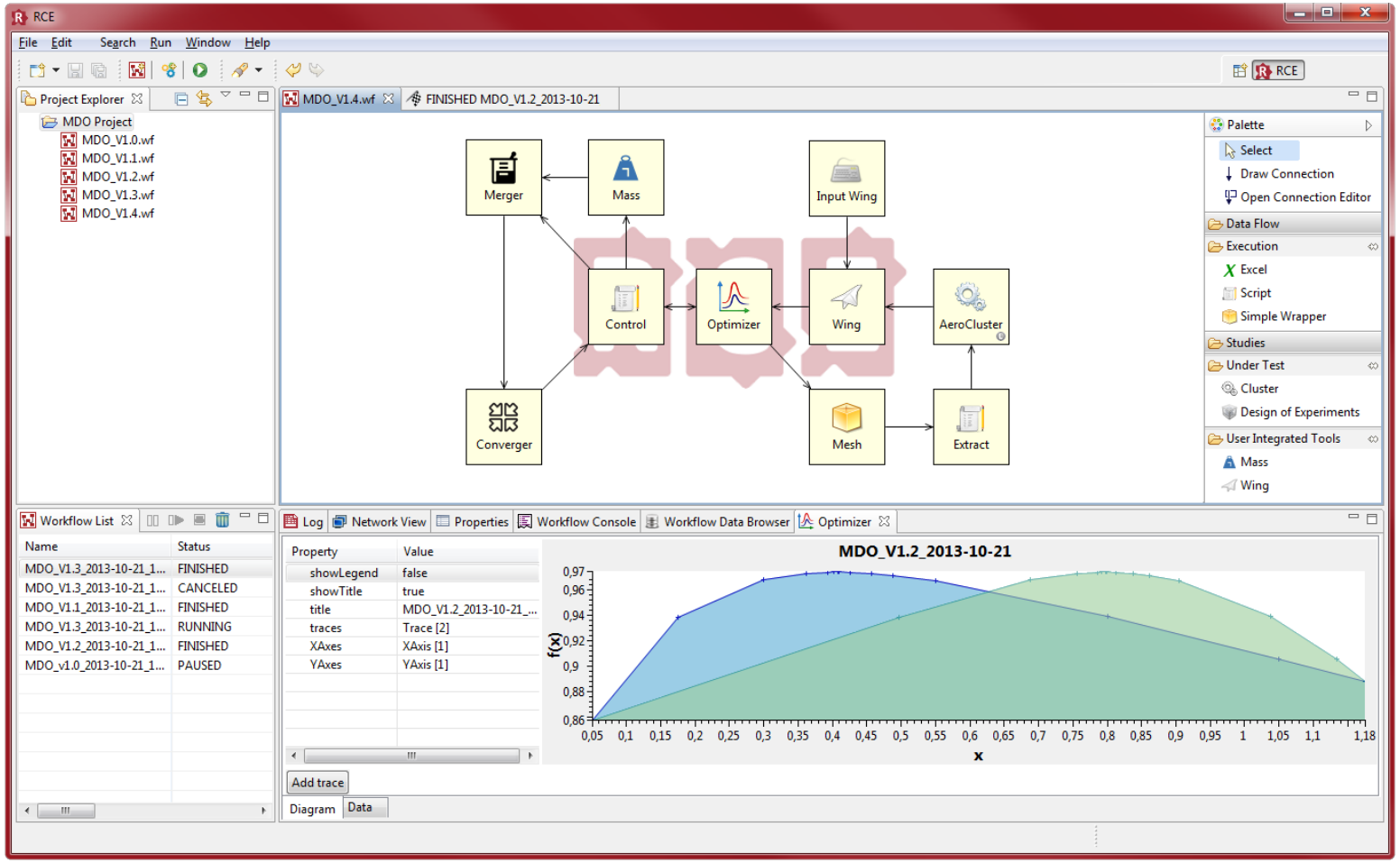
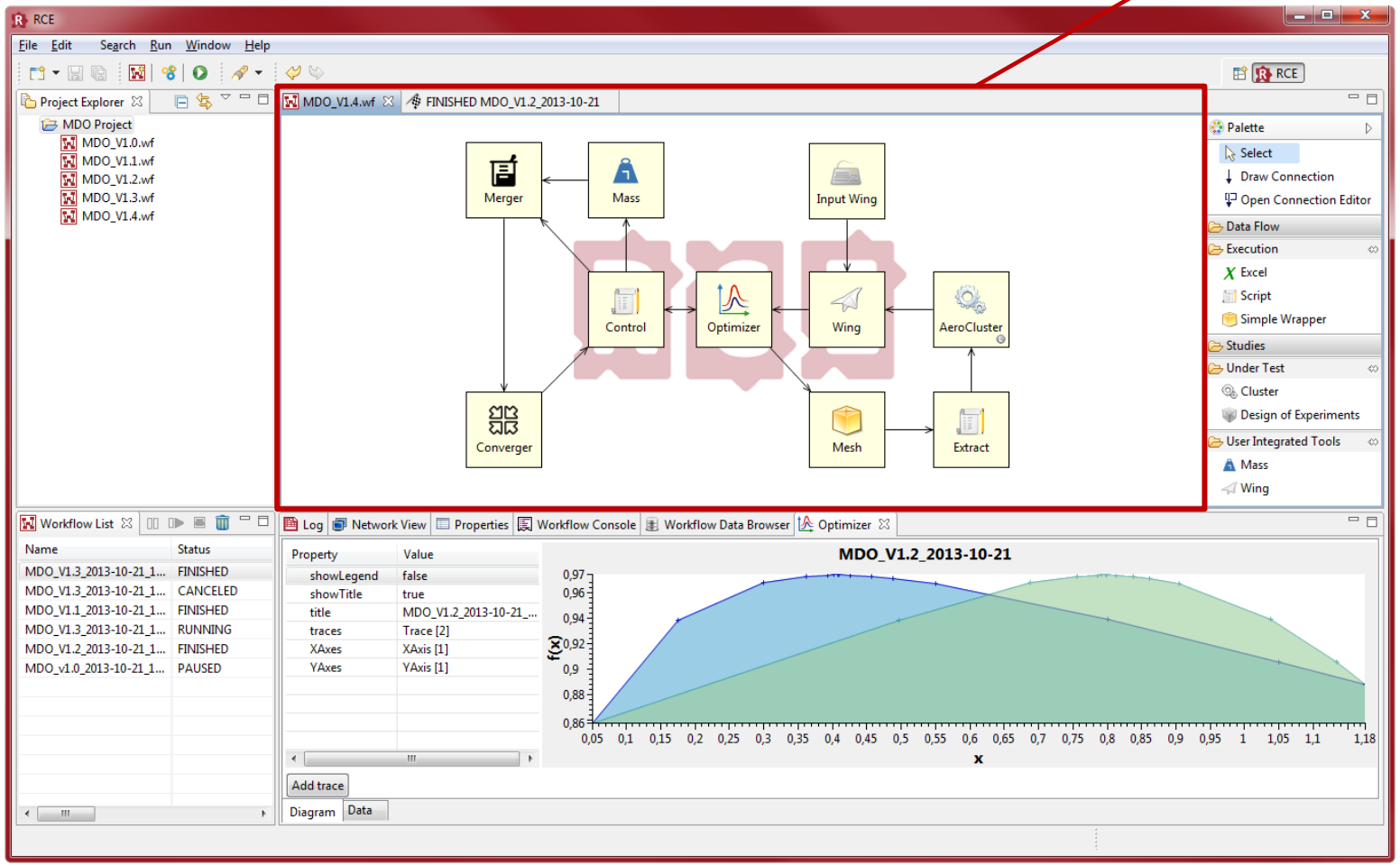
Graphical User Client of RCE



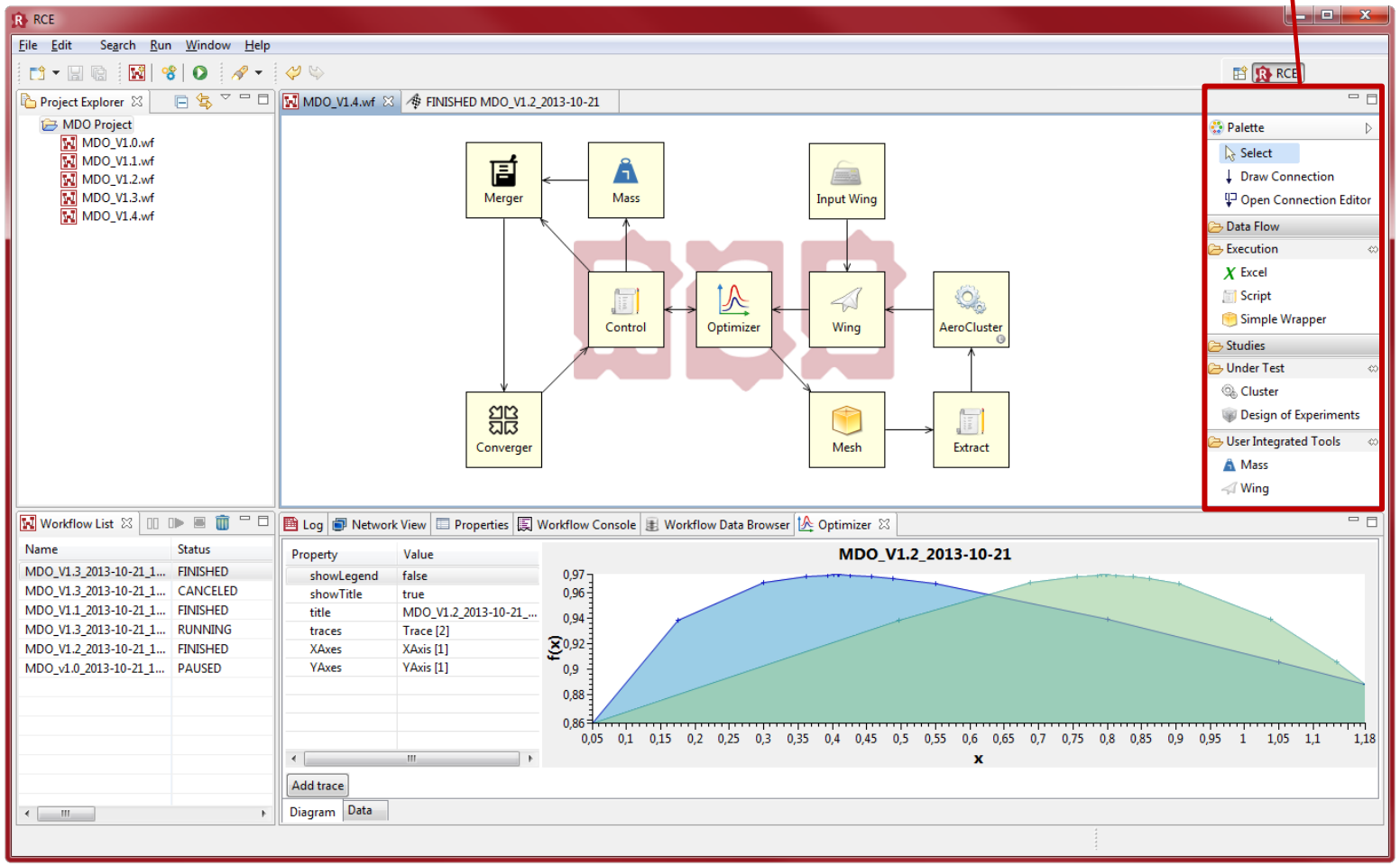
Graphical User Client of RCE

Couple aircraft design tools to executable workflows



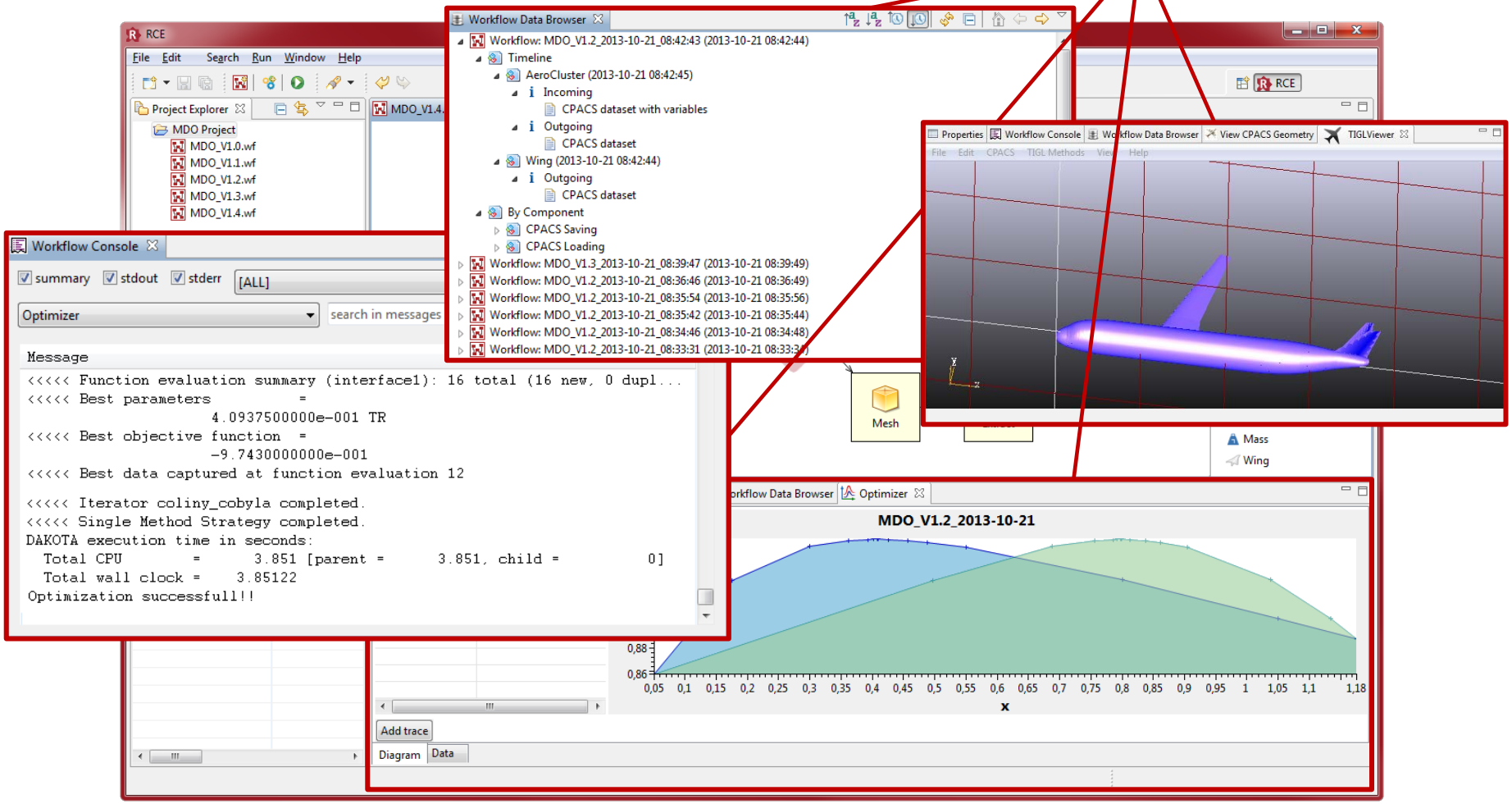
Graphical User Client of RCE

Extend RCE with external aircraft design tools and publish them for others



Graphical User Client of RCE

See results of workflow runs



RCE Enables Ad-hoc Multidisciplinary Collaboration

- RCE enables ad-hoc coupling of distributed aircraft design tools to a workflow

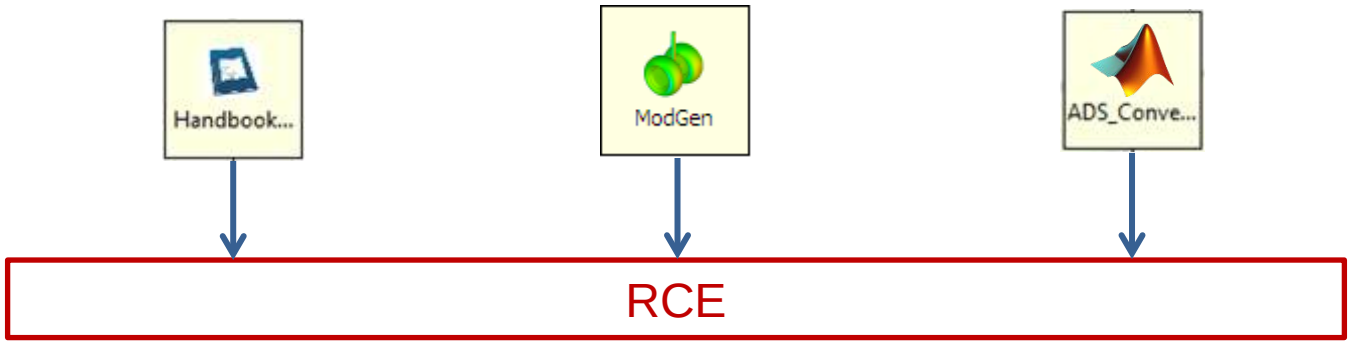
- Requires integration of aircraft design tools into RCE at runtime

  → Modularity and dynamic

  → OSGi: “Set of specifications that define a dynamic component system for Java”

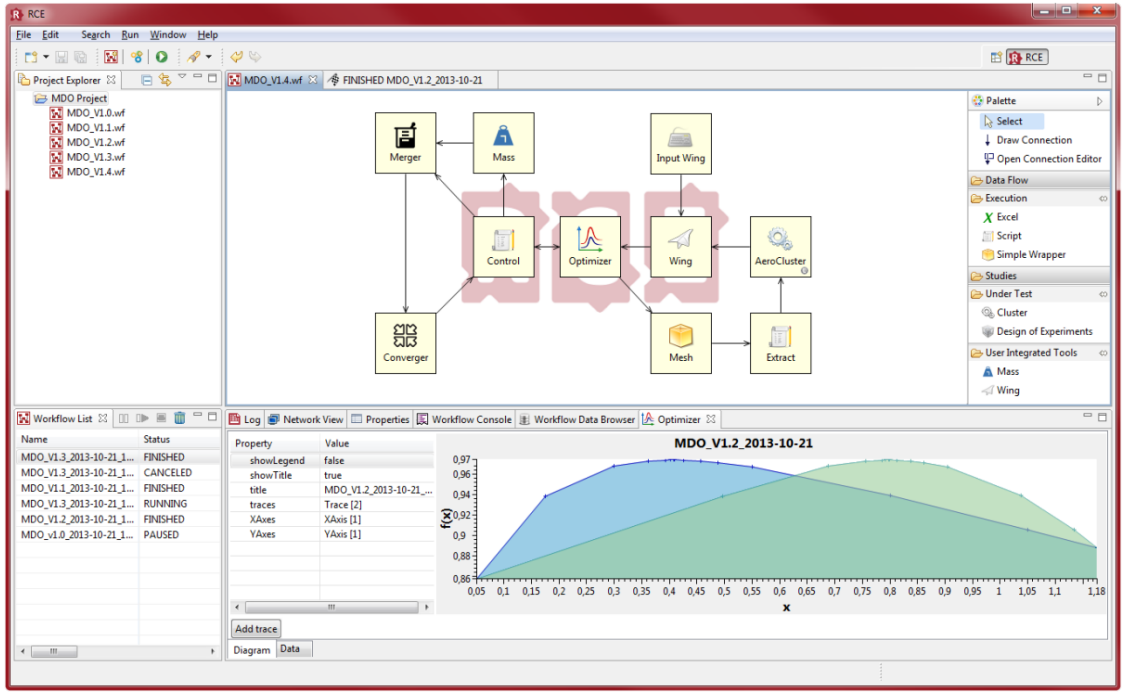
Using OSGi to Integrate Tools at Runtime

- A tool is (un-)registered as OSGi service once a specific configuration file is dropped into (removed from) a pre-defined folder
- OSGi service registry serves as aircraft design tool registry



Experiences with Usability Regarding Eclipse RCP

- Rich Client Platform helps us to make RCE more usable by adopting existing design decisions made for Eclipse RCP



Who uses RCE?

- Scientists and aerospace engineers
- Persons who are
  - no software developers but develop software
  - smart and love their work
  - wearing suits at conferences and workshops ;)

Who uses RCE?

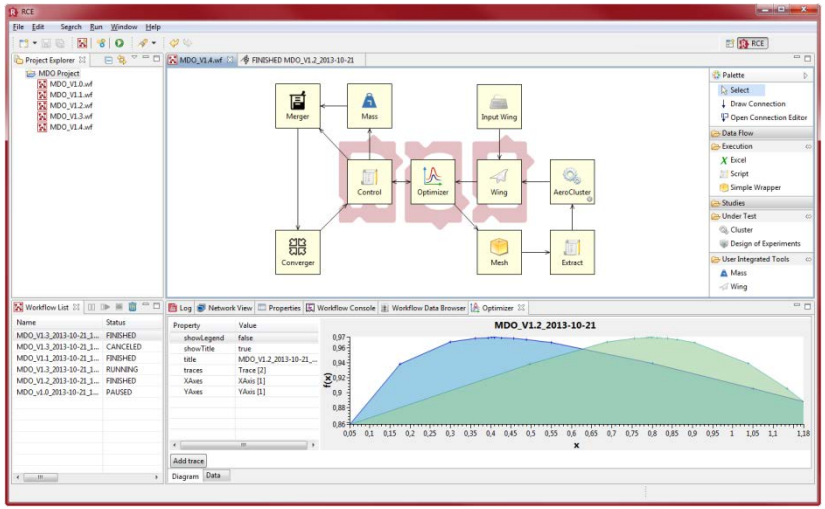
Experiences with Usability Regarding Eclipse RCP

- In terms of usability, users are divided into Eclipse IDE users and Non-Eclipse IDE users
- Some usability concepts we started with, worked out well for first user group and didn’t work out at all for second one
- Two examples…

Views and Perspectives Concept

- Non-Eclipse IDE users get confused and lost, the others like the power of perspectives
- May be a question of training courses

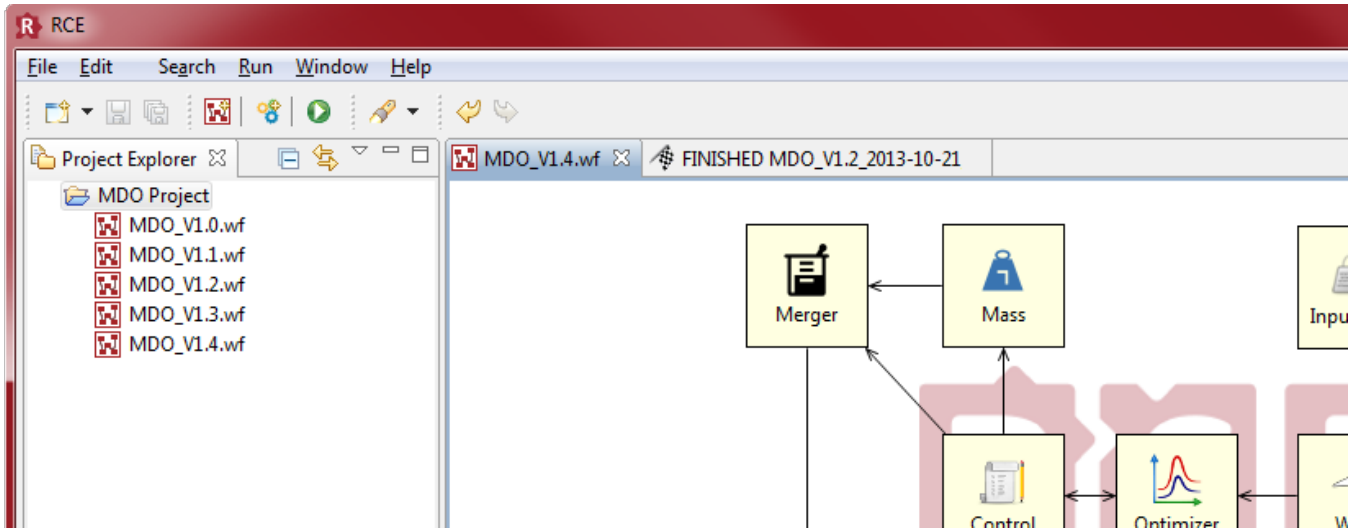
- Our approach: We reduced the perspectives to exactly one and open all relevant views by default



Project-based Concept

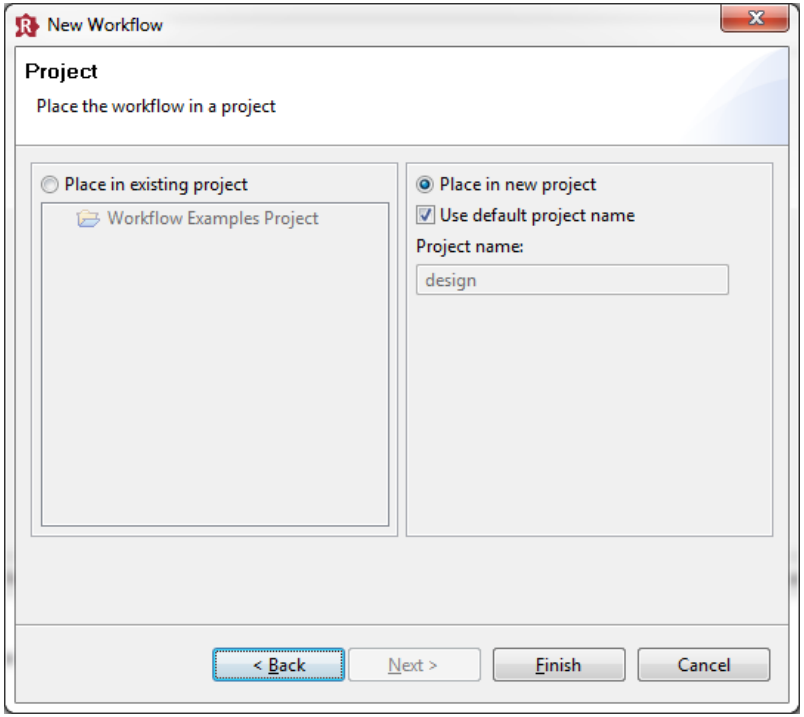
- Every workflow is a .wf file in the project explorer

- Non-Eclipse IDE users get lost if they want to create a workflow for the first time – why must I create a project (first) if I want a workflow?



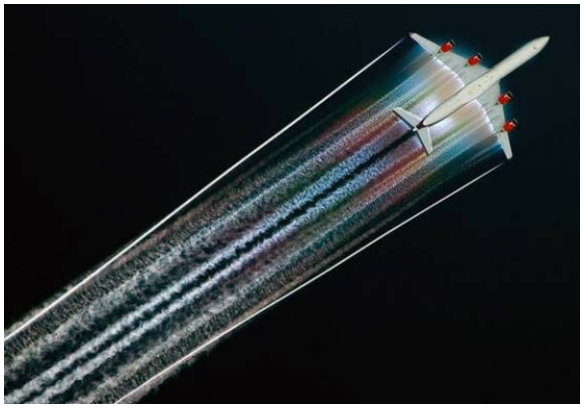
Project-based Concept

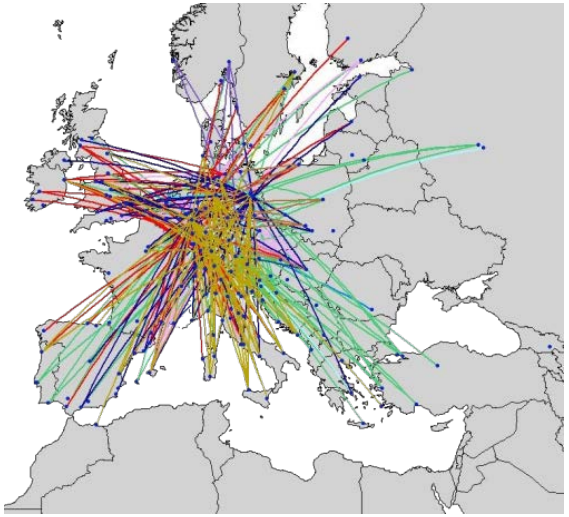
- We conducted a user study within a master thesis regarding the workflow creation task
- It was fun and very helpful
- Result: Dedicated workflow wizard „hiding“ the project creation

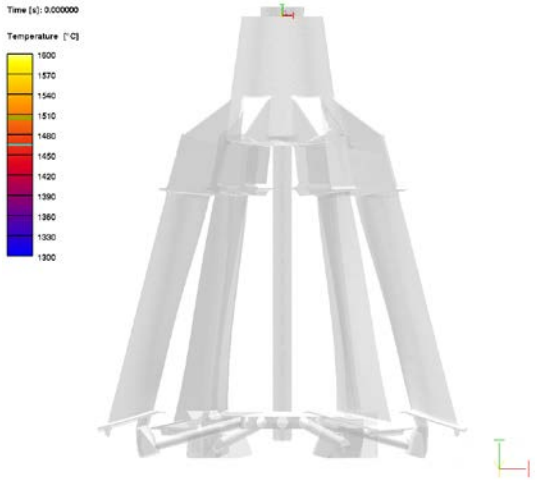


Managing different Distributions of RCE

- RCE has different applications with wide range of requirements



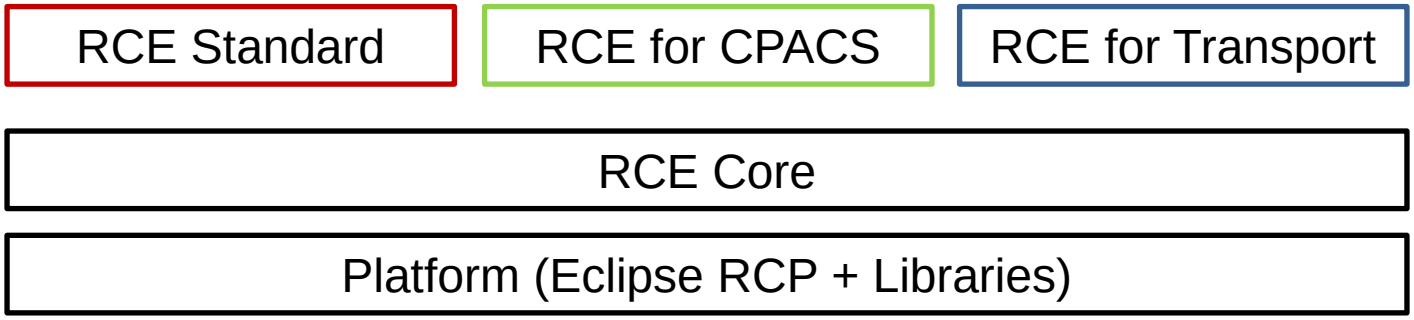




Managing different Distributions of RCE

- We release three different distributions of RCE to have a minimalist distribution for each application

- We used Eclipse IDE distributions as guide line, but: no release train



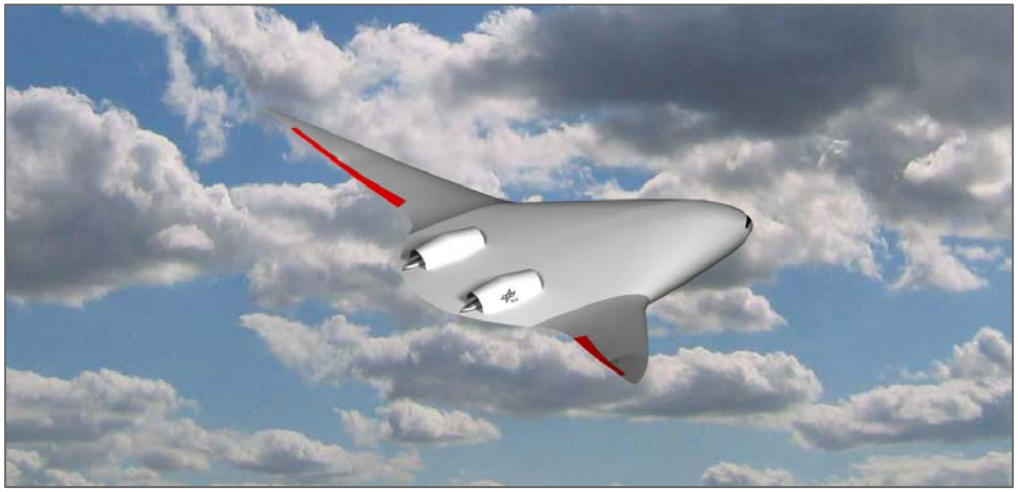
Managing different Distributions of RCE

- p2 infrastructure helps us
  - to compose the distributions, which share common code base
  - to provide a built-in update mechanism with less effort
- We build with Tycho
- Setting up all the stuff was a process…

Current Projects at DLR: FrEACs

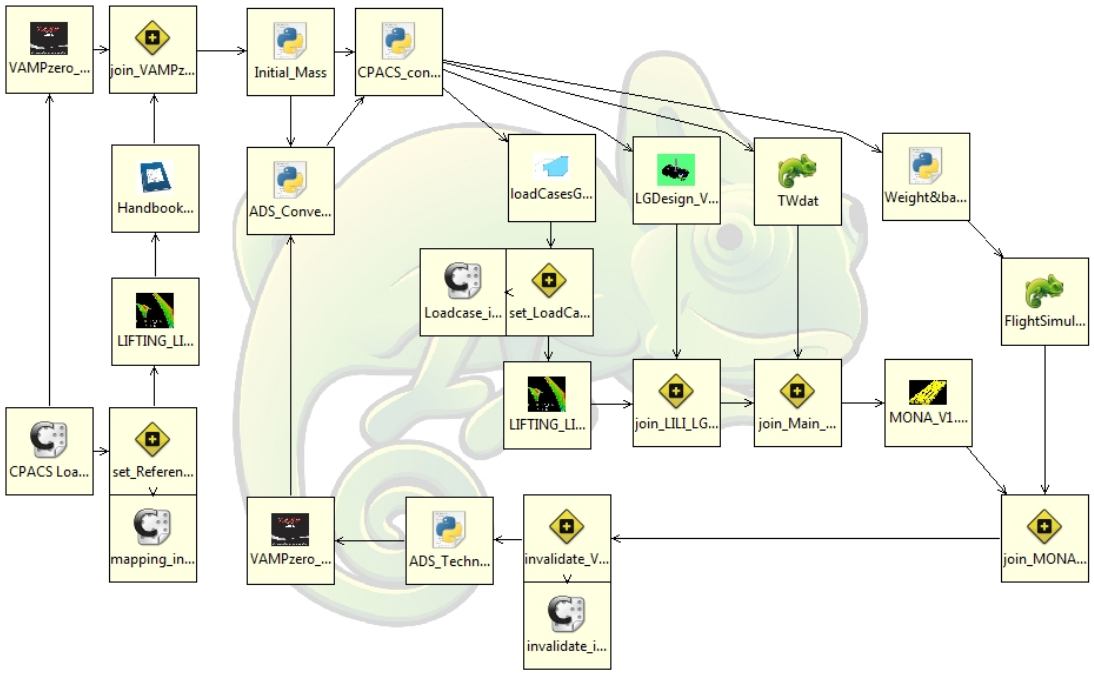
- Future Enhanced Aircraft Configurations

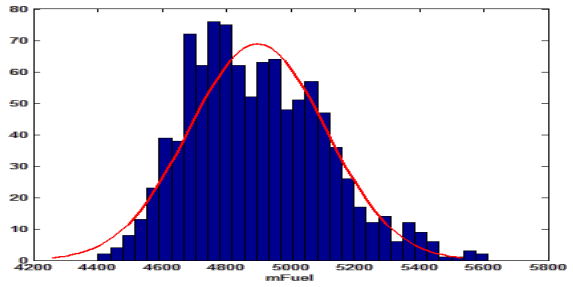
- Evaluate new aircraft configurations such as the blended wing body aircraft

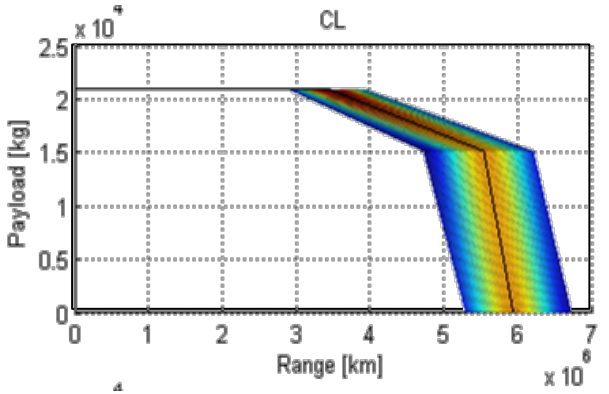


Current Projects at DLR: FrEACs

- Consider uncertainties in the workflow: How reliable are the results?



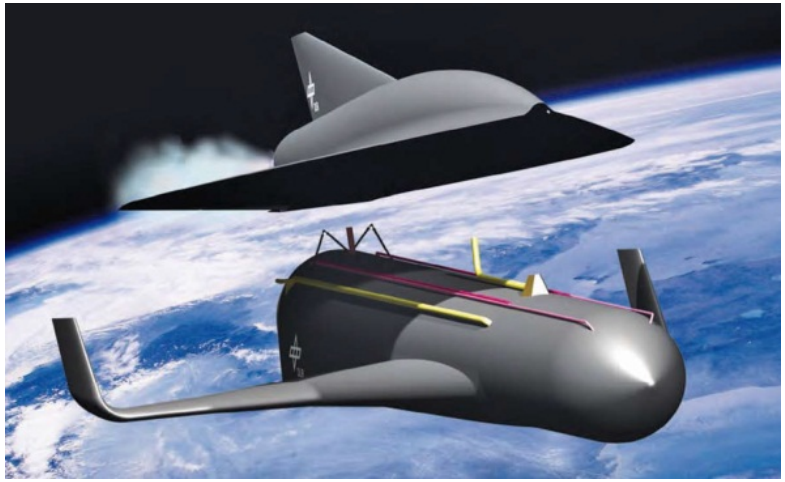


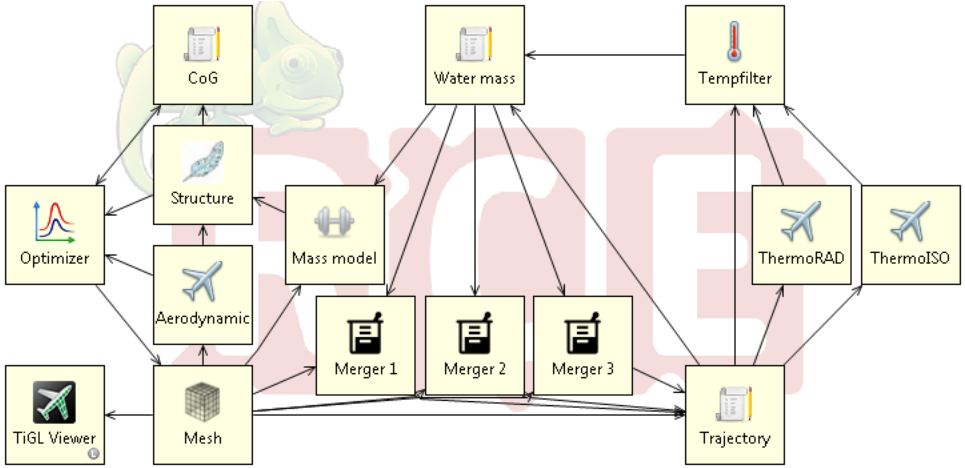


Current Projects at DLR: THERMAS

- Device thermal protection system of the SpaceLiner during atmospheric re-entry

- SpaceLiner is innovative concept between aviation and space travel for ultra fast passenger transport: Europe - Australia in 90 min





Summary

- Eclipse RCP helps significantly to design future aircraft

- Underlying OSGi enables the integration of external aircraft design tools
- Eclipse RCP enforces the development of usable software
- Extensible character, p2, and Tycho allows minimalist distributions

- Not all good concepts of the software engineering world can be adopted for scientists and aerospace engineers

    - …but that makes developing RCE so interesting :)

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