Growing preCICE from an as-is coupling library to a widely-used, batteries-included ecosystem

ESCO 2022 – software workshop

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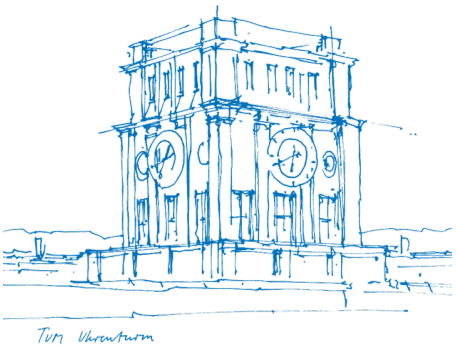
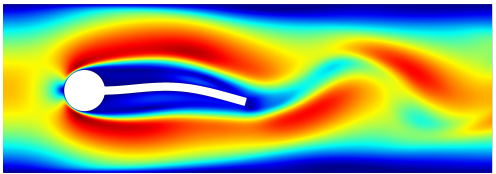
Technical University of Munich

June 15, 2022



Partitioned multi-physics simulations



Fluid-Structure Interaction:
Turek-Hron FSI3 benchmark

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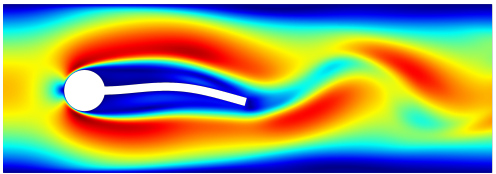

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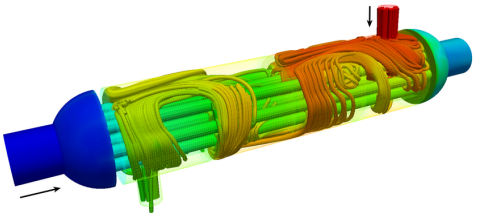
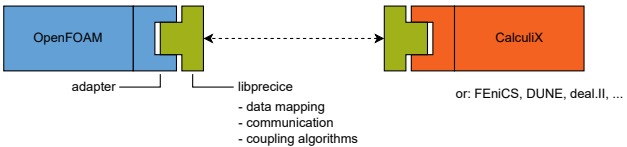


Conjugate Heat Transfer:
heat exchanger

preCICE in a nutshell



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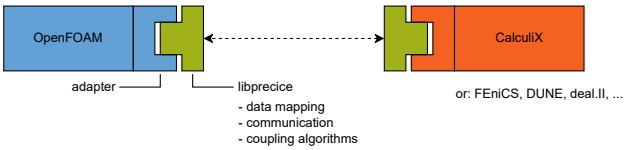


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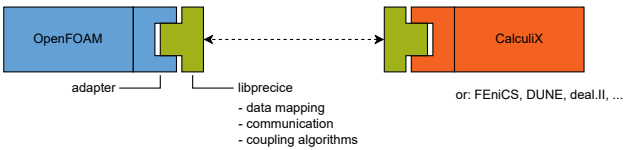


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Adapters and examples for: OpenFOAM, SU2, CalculiX, deal.II, FEniCS, DUNE, Nutils, ...

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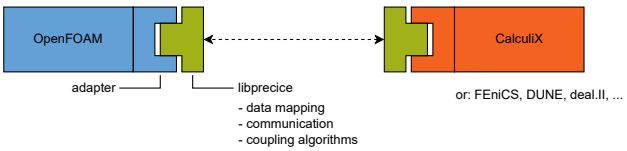


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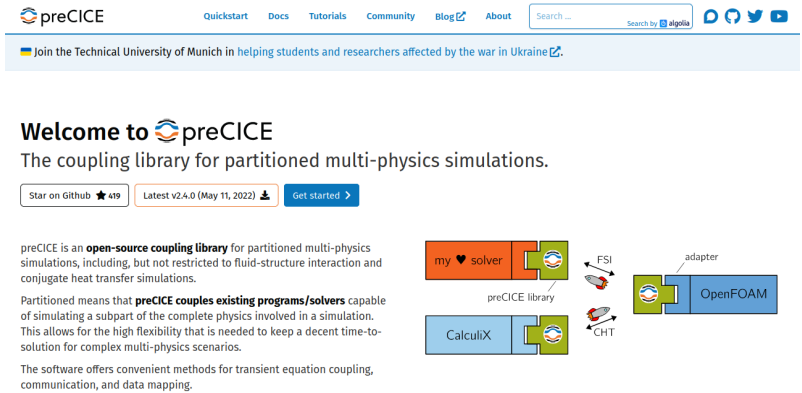
API in C++, C, Fortran, Python, Matlab, Julia

Walking around the website (1)

- Available adapters
- Tutorials
- Quickstart

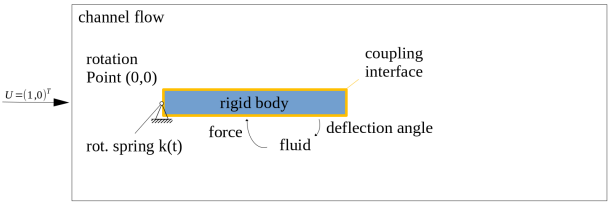


Live demo

Quickstart tutorial:
precice.org/quickstart.html

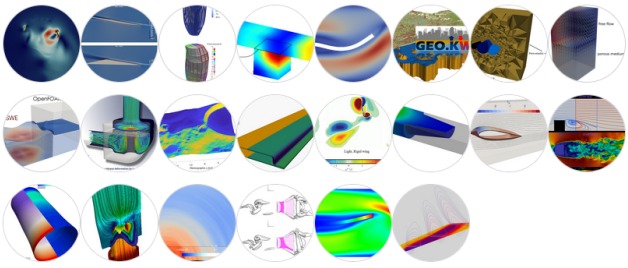
Running on the preCICE demo VM:
precice.org/installation-vm.html

Homework: Run it yourself! :-)



Walking around the website (2)

- Couple your code
- User stories
- Who uses preCICE



Achievements unlocked: Usability & Reachability

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but if you want, you can reach us very easily.

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but if you want, you can reach us very easily.

"Afer the amount of support I received from this community, I am switching to opensource for every one of my needs."

(@nithinadidela on the preCICE forum)

But why all this effort?

We are not the target users of preCICE:
we research and develop methods and software, not applications.

Lessons learned

Lessons learned: Technical

1. Library vs framework
2. Separation of concerns
3. Few, common dependencies
4. Packages for common platforms
5. Standard practices (e.g., xSDK, OpenSSF Best Practices, code quality checkers)

Project Status

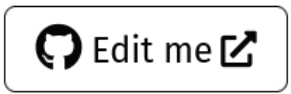
release v2.4.0 | doi 10.18419/darus-2613 | Build and Test passing | system tests check

Project Quality

openssf best practices passing | codefactor A | lgtm:C++ A+ | codecov 89%

Lessons learned: Documentation

1. Content from multiple sources, rendered at one place
   - website + a wiki for each repository + dev docs → website
   - content next to code
   - content available offline
   - export to one PDF
2. Very easy to contribute (“edit me” button + review)



Lessons learned: Documentation (2)

Q&A strategy: add to the documentation, send link as answer

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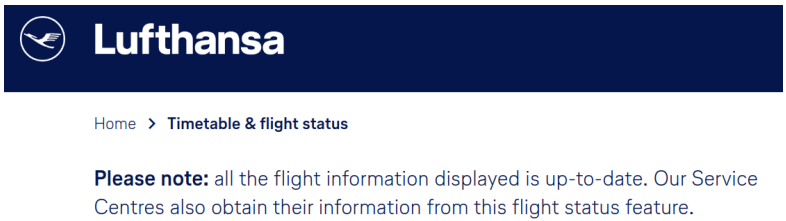
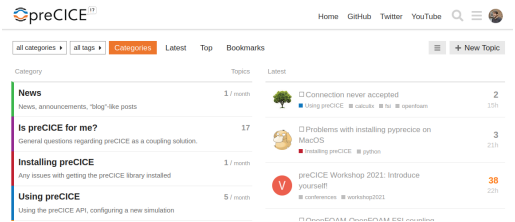


Lessons learned: Communication

1. Mailing list + chatroom → Discourse forum
   - Threaded, great search, tags, categories, answers, ...
   - Also used as blog, FAQ, conferences
2. Too many requests → Support program
3. preCICE Workshops (+ feedback, training)
4. Some marketing is essential.

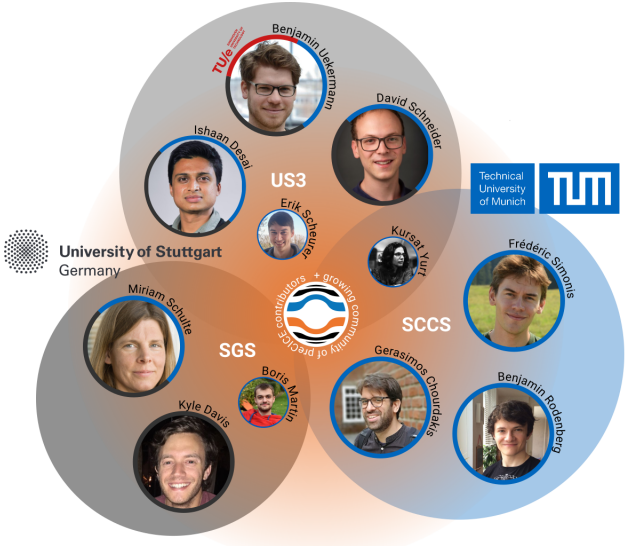


Not discussed (feel free to ask)

- Features, numerics, performance
- Testing and CI
- Collaboration & project management
- Publication and release strategy
- ...

Key reference (fresh!)

People


Benjamin Uekermann
David Schneider
Ishaan Desai
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Erik Scheuer
Kursat Yurt
University of Stuttgart
Germany
Technical University of Munich
Frédéric Simonis
Miriam Schulte
SGS
+ growing community of preCICE contributors
SCCS
Gerasimos Chourdakis
Boris Martin
Benjamin Rodenberg
Kyle Davis

Funding

Supported by:

Federal Ministry
for the Environment, Nature Conservation,
Nuclear Safety and Consumer Protection

based on a decision of
the German Bundestag

DFG

- Research Software Sustainability
- EXC 2075 SimTech

EuroTech Universities

SPPEXA

KONWIHR

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 754462

Advertisements

Talk tomorrow (David Schneider):
"Towards Large-Scale Data Mappings for Scattered Data"

DT session, after lunch

Summary

Main message: always think of the user, it may be highly beneficial (in the long run).

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`gerasimos.chourdakis@tum.de`
(and many more)

Slides & feedback: go.tum.de/200137