



THE NEW GEOPHYSICS PROGRAMME AND THE PROJECT SOFTWARE TECHNOLOGIES FOR MODELLING AND INVERSION (PROJECT 46)

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Research Centre
for Gas Innovation

cleaner energy for a sustainable future

RCGI Internal Workshop
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PROGRAMMES AND PROJECTS

Engineering Programme

Projects 1 to 10 + Project 29



Physical-Chemistry Programme

Projects 11 to 20



Economics & Energy Policies Programme

Projects 21 to 28



CO2 Abatement Programme

Projects 30 to 45



Geophysics Programme

Project 46

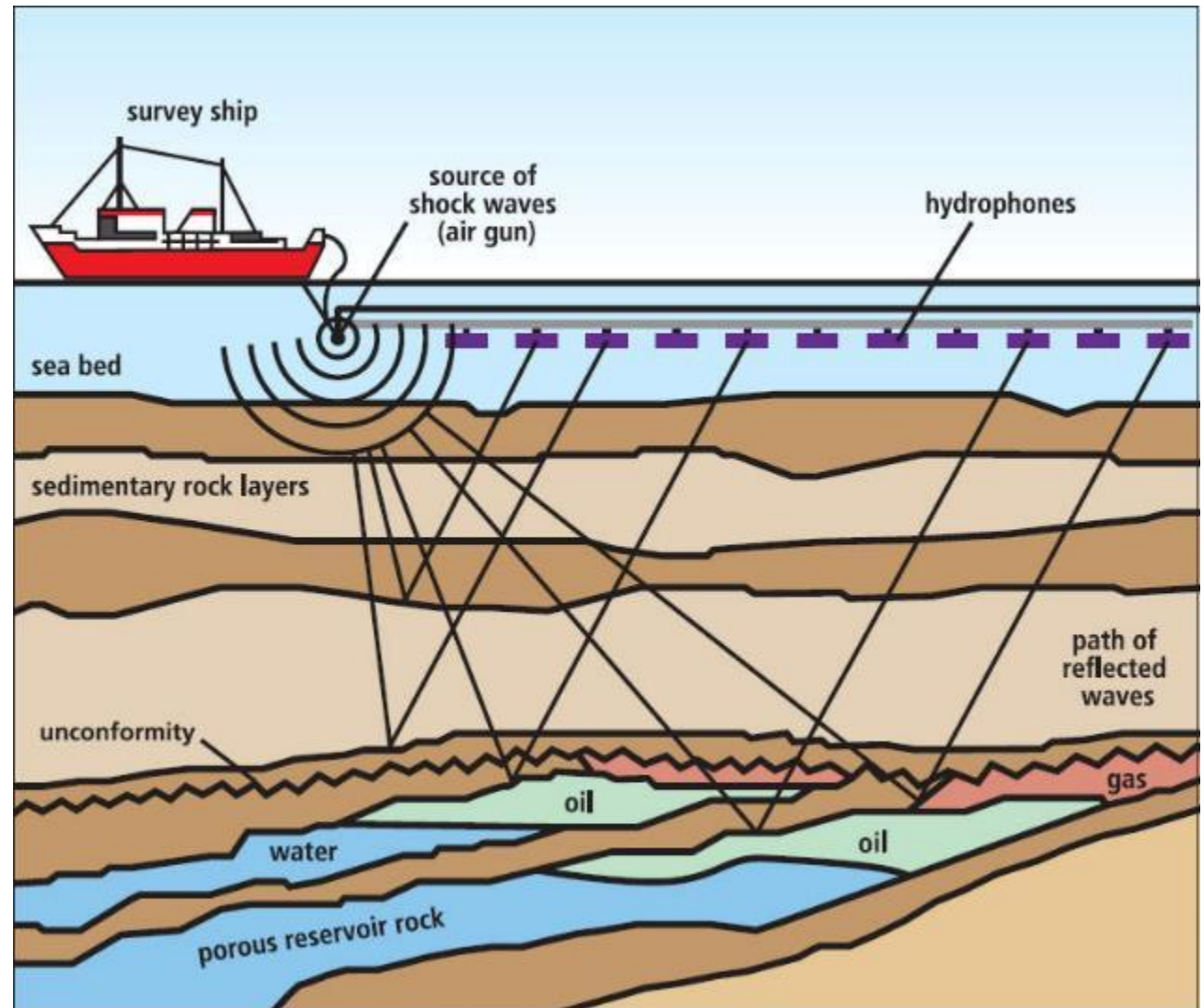


Geophysics programme and project 46

- **Geophysics:** is a subject of natural sciences concerned with the physical processes and physical properties of the Earth and its surrounding space environment, and the use of quantitative methods for their analysis.
- Includes geology, freshwater bodies, ocean and atmosphere.
- Programme should comprise projects that deal with the interface between geophysics and gas
- Project 46: Software Technologies for Modelling and Inversion, with applications in seismic imaging

Project scope

- **Objectives:** to develop software technologies for high performance numerical simulations and to solve inverse problems, which could enable scientists and engineers to develop and test models easier and faster
- **Key characteristics:** abstraction, automatization, layering, flexibility, portability, performance, integration
- **Main application:** geophysics – seismic imaging



Project Overview

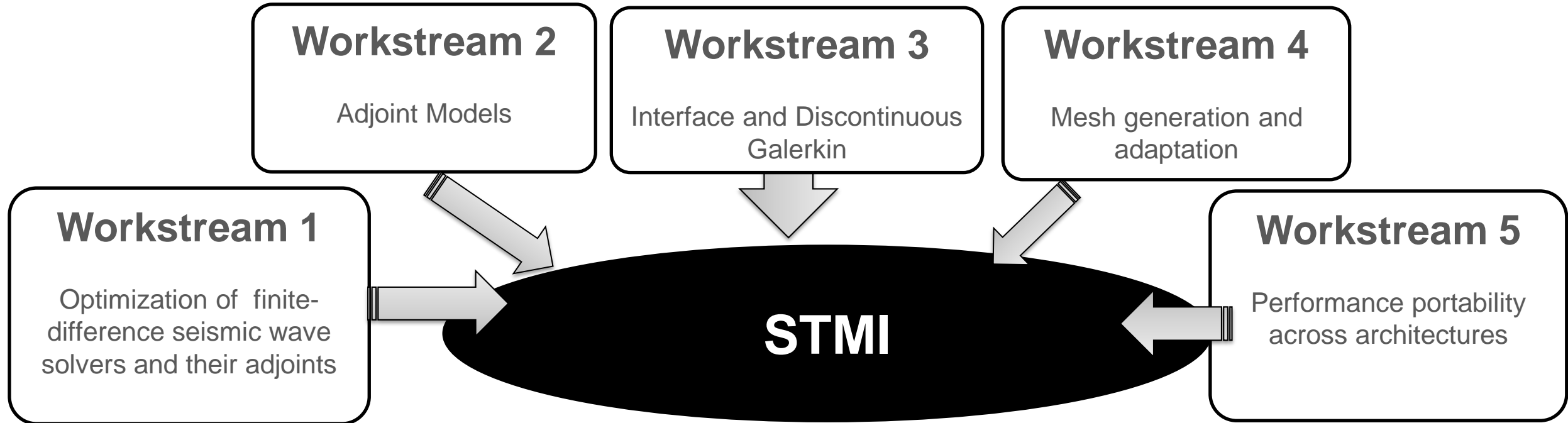
- **Workstreams:**

1. Optimised finite-difference algorithms for direct and adjoint problems
2. Automatic generation of adjoint models
3. Optimised high order discontinuous methods for modelling and inversion
4. Automatic generation and adaptation of unstructured meshes
5. Compiling technologies and performance portability

- **Team: 65 people**

- 11 Faculty
- 9 Postdocs
- 14 PhD students
- 5 MSc students
- 11 Undergrad students
- 2 Developers
- 1 Admin staff
- 12 Visiting professors

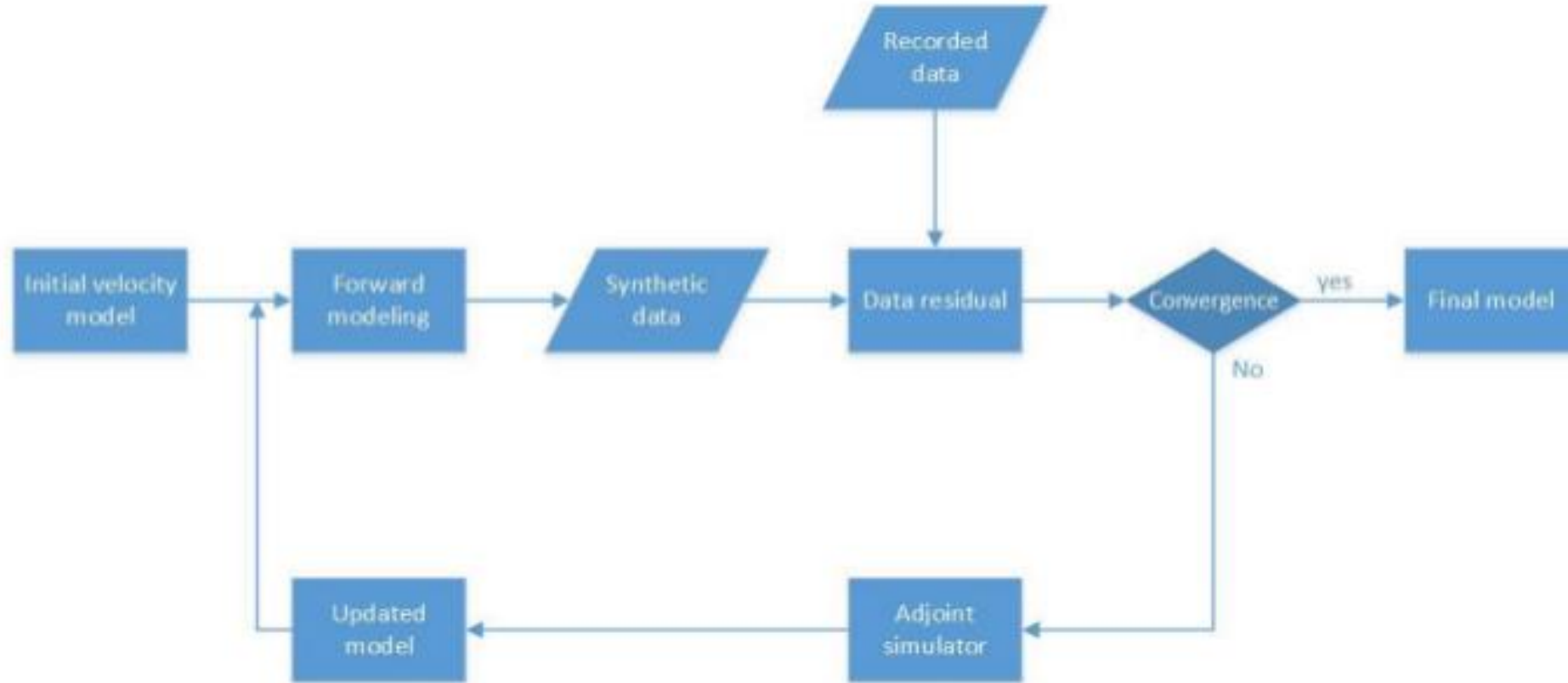
Geophysical Computing



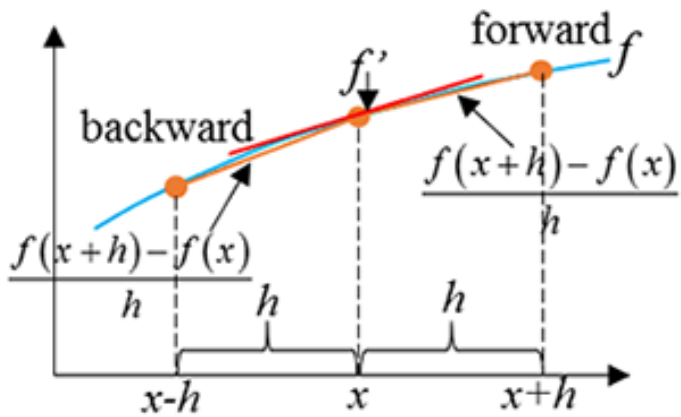
Infrastructure Project

Refurbish Office Space &
Install and Access a Variety of Testbed of Hardware architectures

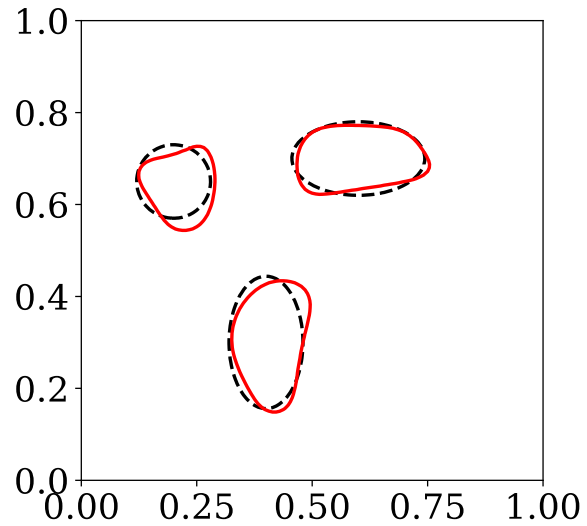
Seismic imaging as an inverse problem



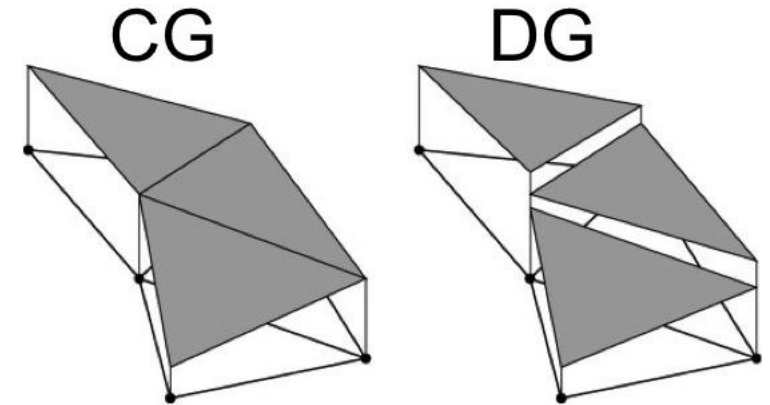
Numerical methods



Finite differences

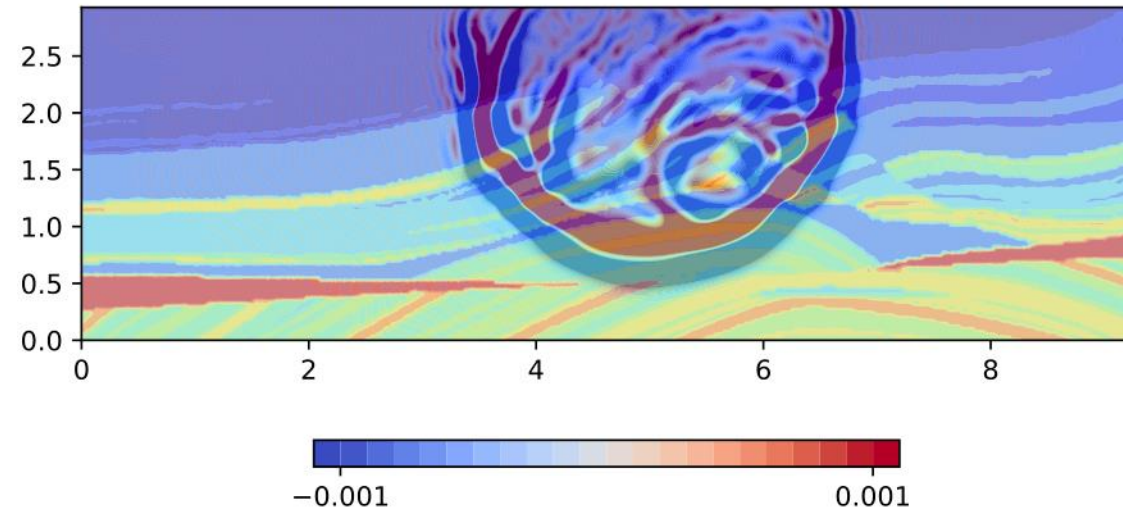
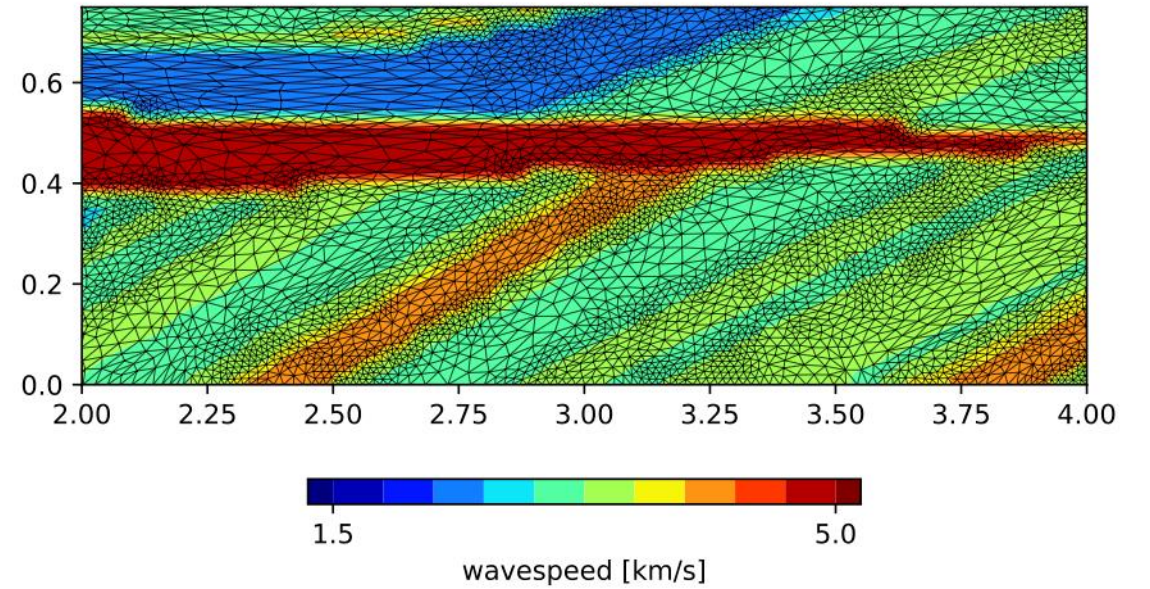
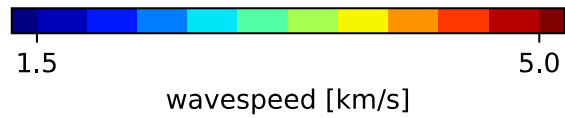
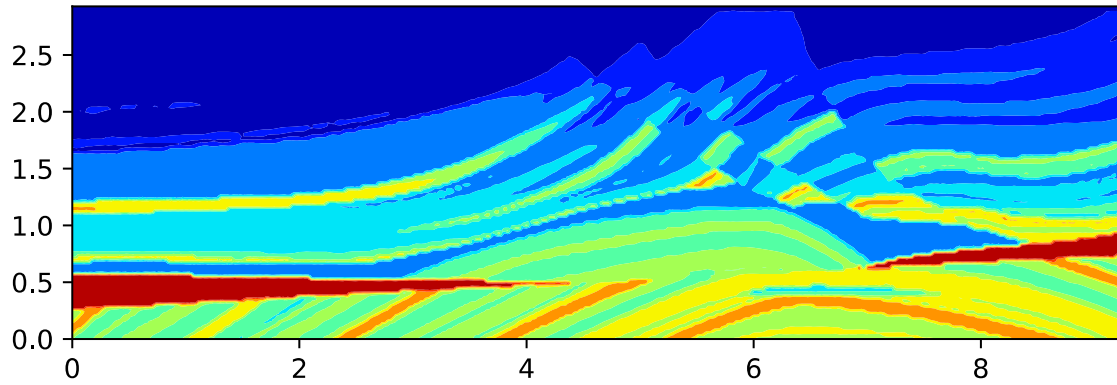


Level set

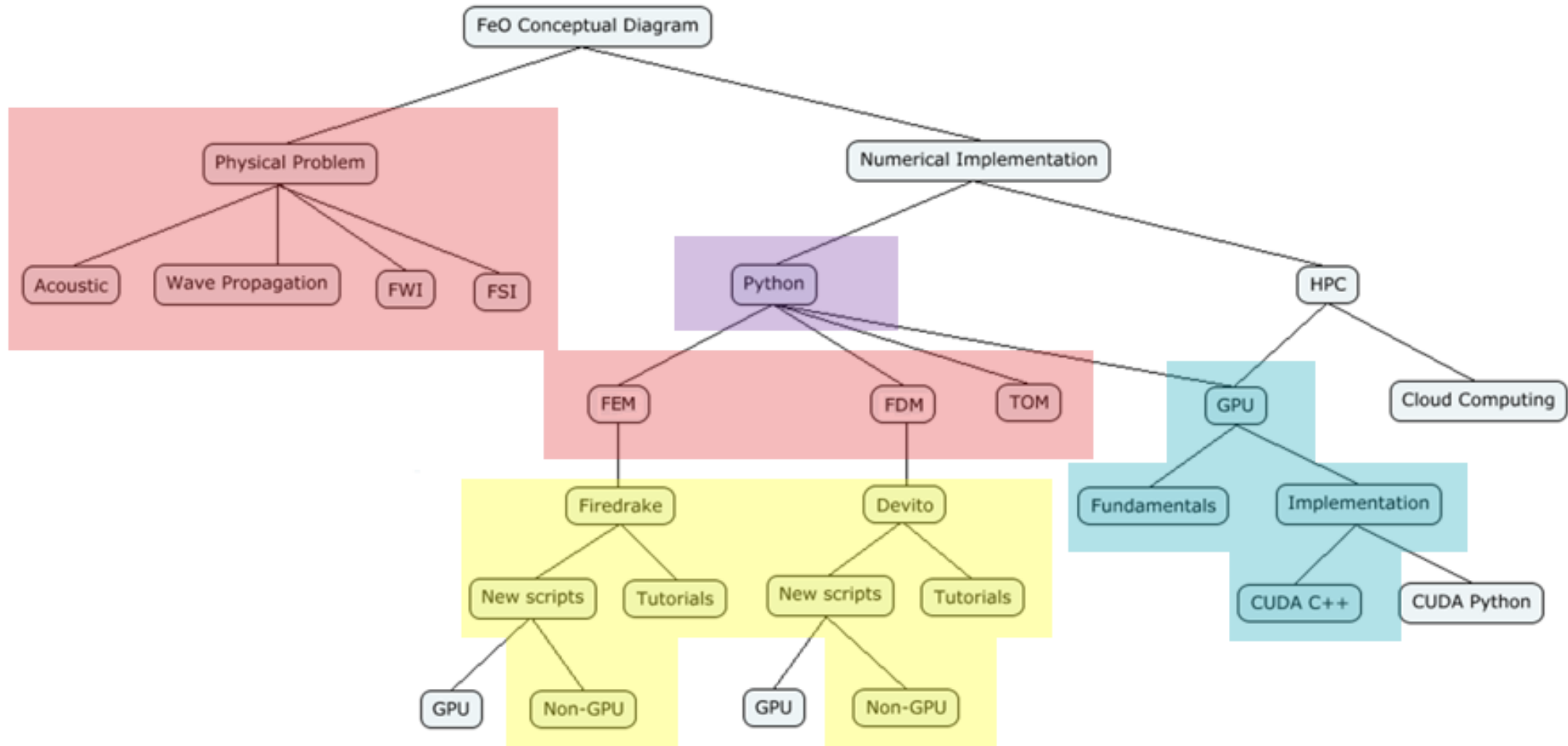


High-order, discontinuous Galerkin

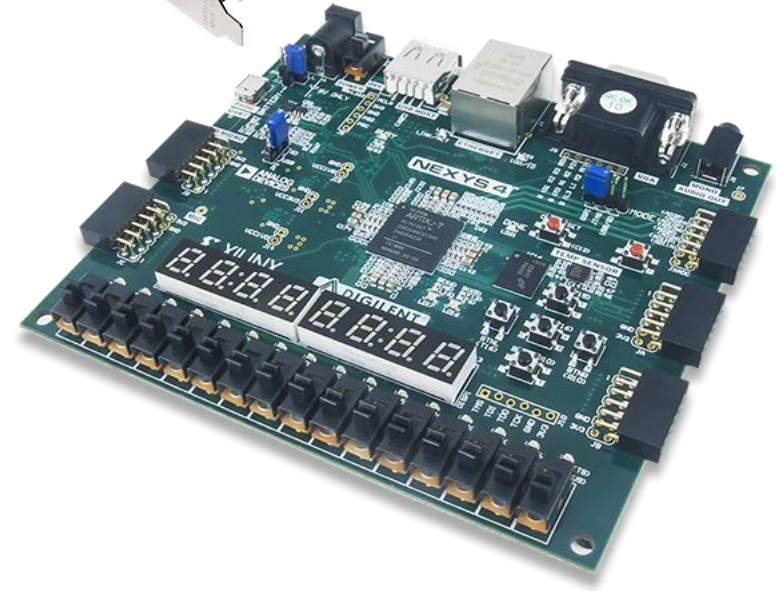
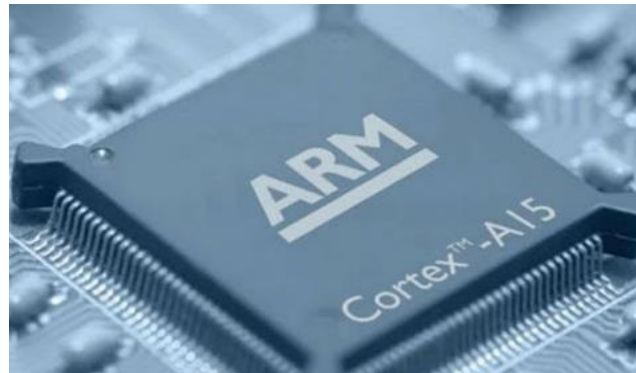
Mesh generation



Flexibility



High-performance computing





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THANK YOU



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