

Experience Open Simulation with the salome_meca platform

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IBFEM-4i 2019 *9th–12th September*



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Presentation of the salome_meca platform

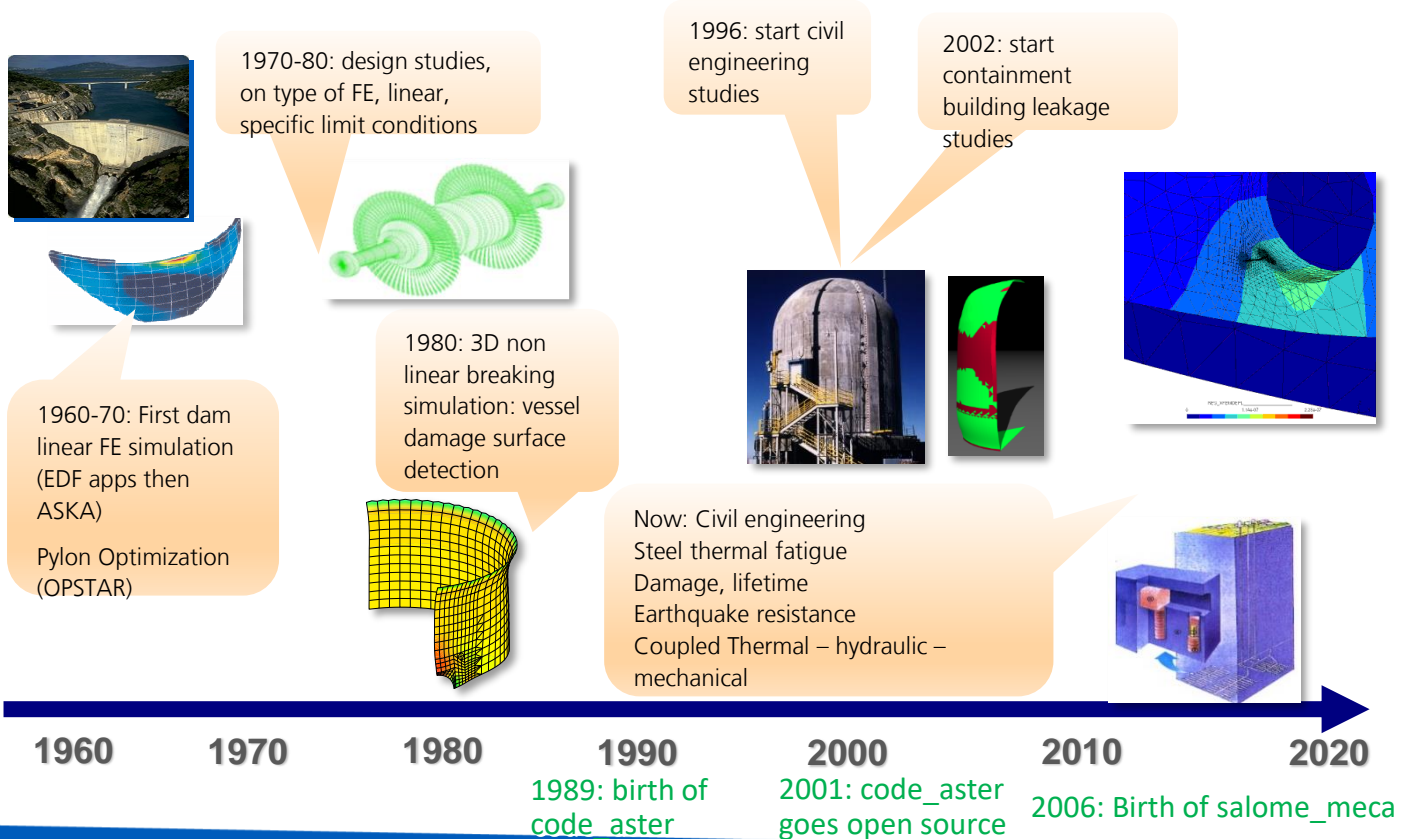
Applications

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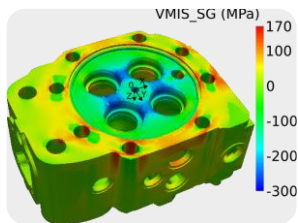
Applications

50 years of numerical simulation

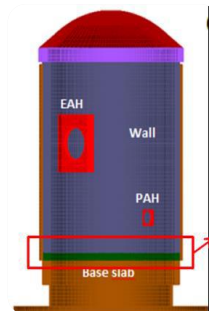


From fundamental research to industrial applications

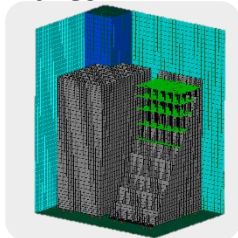
Diesels engines



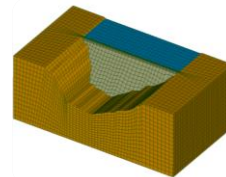
VERCORS mock up and its digital twin



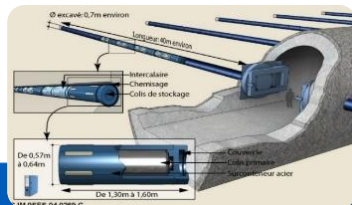
Fuel Assemblies



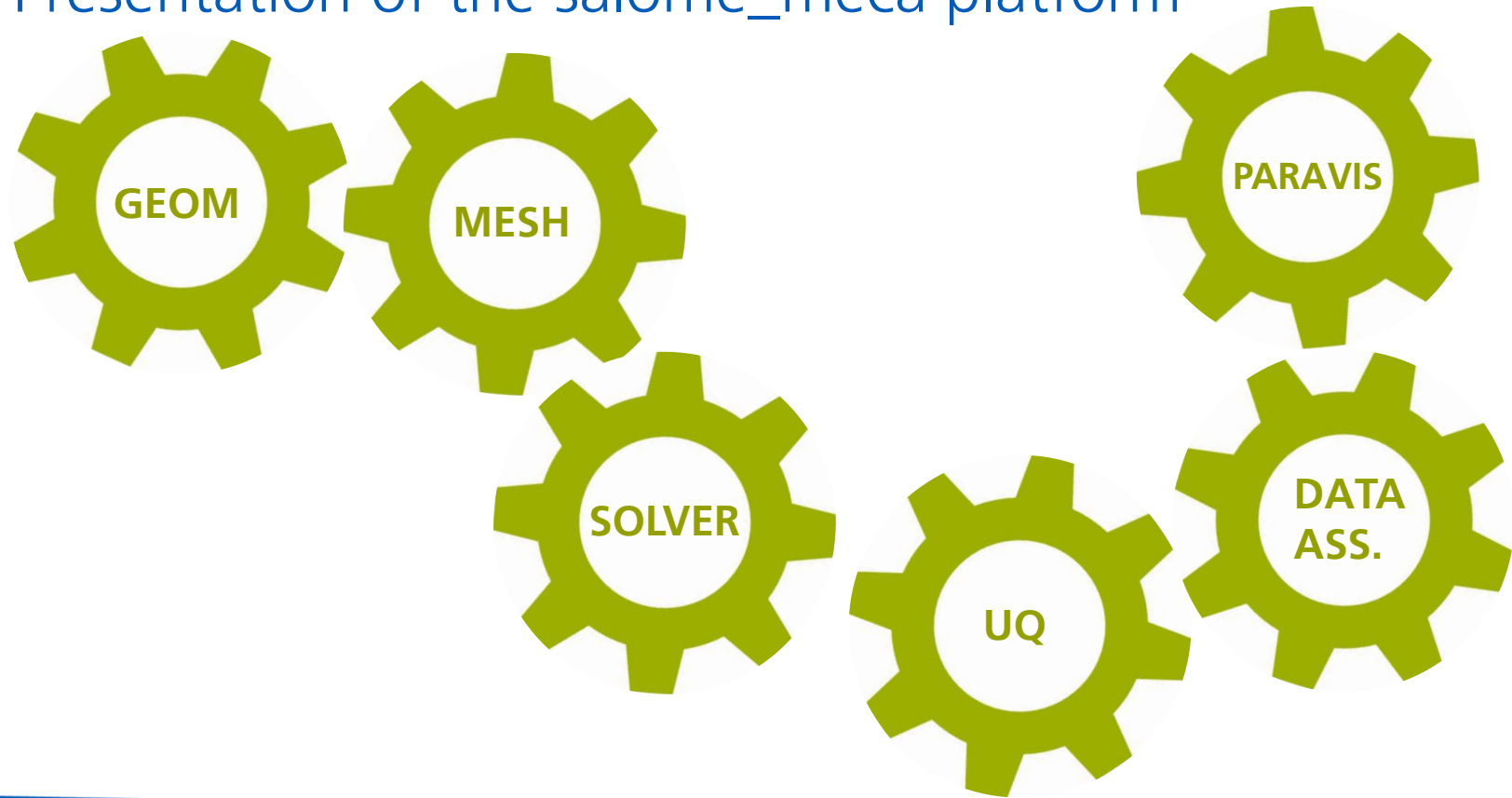
Civil structures subjected to earthquakes



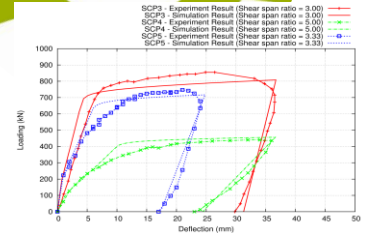
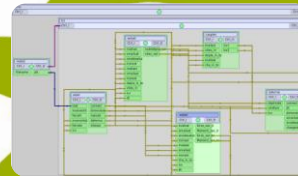
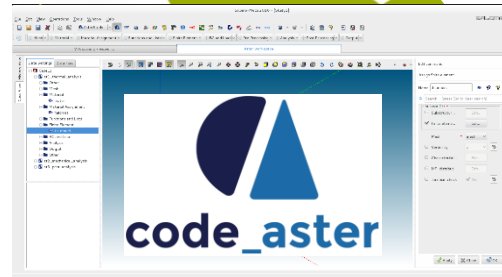
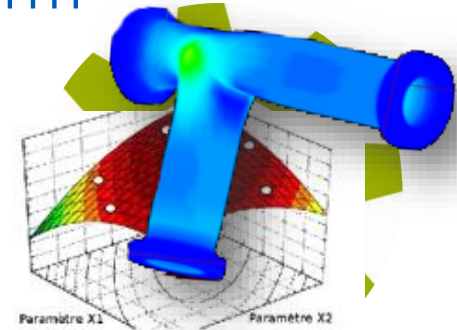
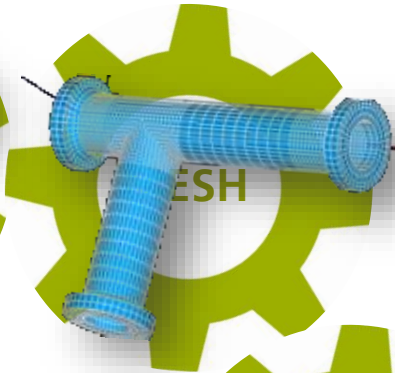
Underground galleries



Presentation of the salome_meca platform



Presentation of the salome_meca platform



An open-source and free platform



Commercial code



Open code

AsterStudy: Strong interaction between the mesh and the analysis

The screenshot displays the Salome-Meca 2017.0 software interface. The main window shows a 3D mesh model of a mechanical part, rendered in green. The interface includes a menu bar at the top, a toolbar, and a central workspace. On the left, there is a 'Data Settings' panel with a tree view showing the project structure: Case_1, Stage_1, Mesh, and Material. The 'Material' section is expanded, showing a 'fieldmat: Assign a material' dialog box. This dialog box has a search field containing 'BK' and a list of materials. The material 'BKP_COQUE' is selected. Below the list, there is a 'Manual selection' field and buttons for 'Cancel', 'Abort', and 'OK'. The status bar at the bottom shows the current file name and page number (3/4).

Applications | Emplacements | salome | mer. 19 juil. 15:51:51 | A | CPU | mem | temp | réseau | disque | Salome-Meca 2017.0 - [Study1]

File | Edit | View | Operations | Commands | Tools | Window | Help

Mesh | Model Definition | Material | Functions and Lists | BC and Load | Pre Analysis | Analysis | Post Processing | Fracture and Fatigue | Output

Aster workspace

Data Settings | Data Files

- Case_1
 - Stage_1
 - Mesh
 - mesh Read a mesh
 - Material
 - fieldmat: Assign a material

Information

fieldmat = AFFE_MATERIAU()

History View | Case View

E50954@dsp0780510: /opt/sal... | Vidéos | Salome-Meca 2017.0 - [Study1] | *Document 1 non enregistré - ged8 | 3 / 4

Edit command

assign a material > Material assignment > [0] > Group of element

Name fieldmat

BK

mesh (LIRE_MALLAGE)

Name	Size
<input type="checkbox"/> BKL_V20PIS	202
<input type="checkbox"/> BKL_V7PIS	210
<input type="checkbox"/> BKL_VOILE	8109
<input type="checkbox"/> BKP_BY26P85	151
<input type="checkbox"/> BKP_BY3P5	1334
<input checked="" type="checkbox"/> BKP_COQUE	12634
<input type="checkbox"/> BKP_DALLE	2413
<input type="checkbox"/> BKP_FDPIS	135
<input type="checkbox"/> BKP_FD TUB	45
<input type="checkbox"/> BKP_KN1D1	6
<input type="checkbox"/> BKP_KN1D10	2
<input type="checkbox"/> BKP_KN1D11	13
<input type="checkbox"/> BKP_KN1D12	31
<input type="checkbox"/> BKP_KN1D2	185
<input type="checkbox"/> BKP_KN1D4	42
<input type="checkbox"/> BKP_KN1D7	400

Manual selection

Cancel Abort OK

Evolution under quality assurance

- Production of :
 - Source code (*1 600 000 lines*)
 - Documentation (*23 000 pages, 2300 documents*)
 - Reference
 - User
 - Validation
 - Verification (tests) (*3 600*)
- Version management
 - History of all version is recorded
 - Possibility to get back to any version
 - Any new development must work on all verification tests
- 40 versions per year
 - Major version of code_aster and salome_meca every 2 years
 - Minor version of salome_meca every year
 - Minor version of code_aster every 6 months
 - Development version of code_aster every week

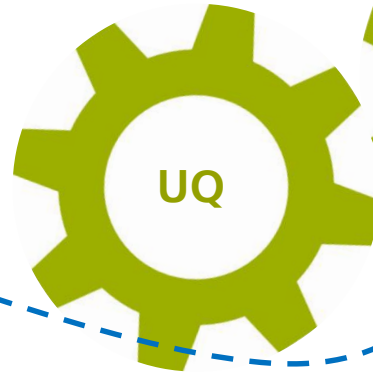
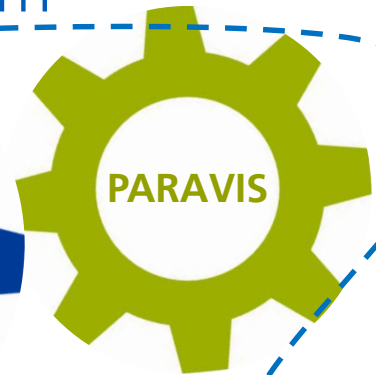
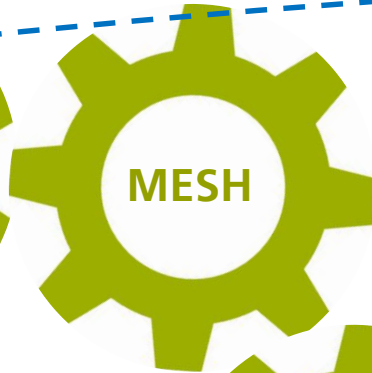


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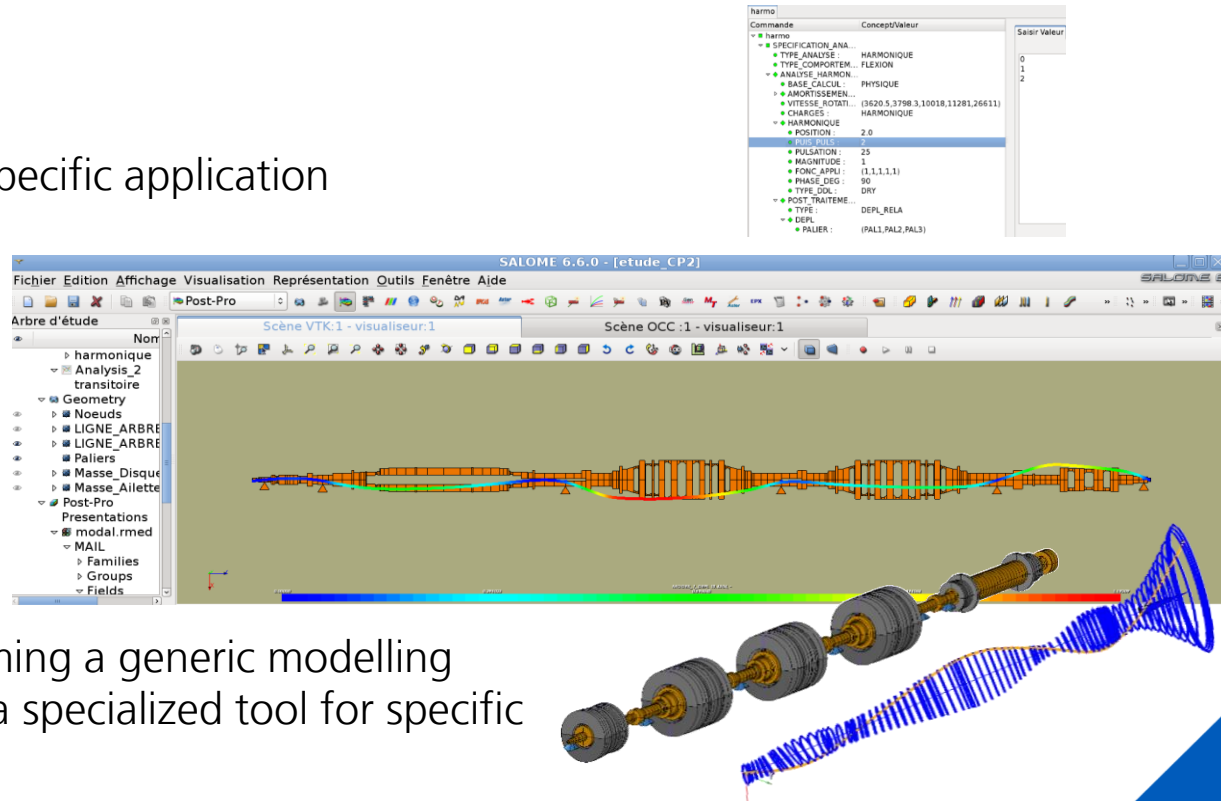
Applications

Presentation of the salome_meca platform



Example: Rotating machine customized app

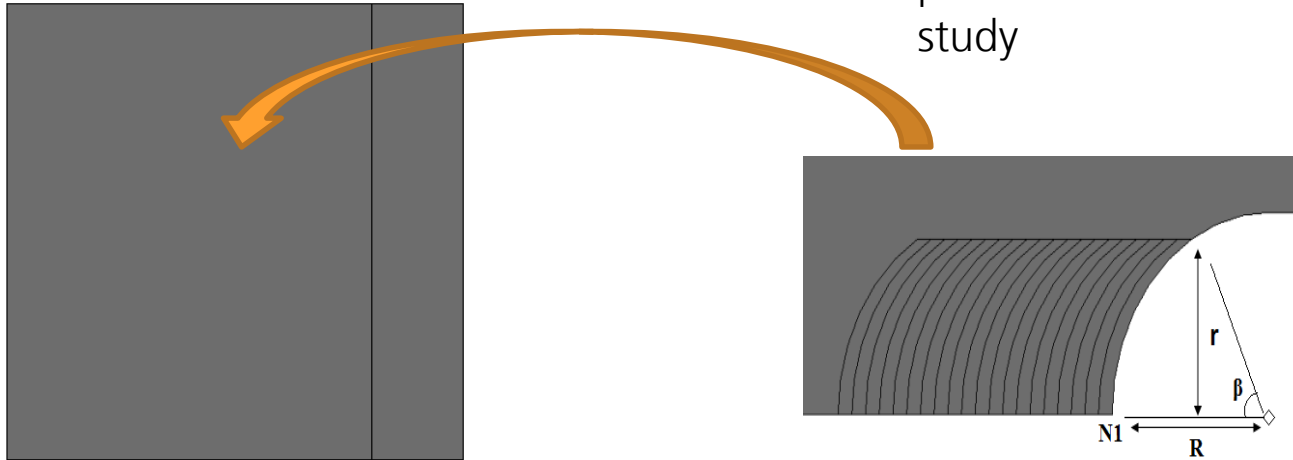
- What is a customized app?
 - Coupling different codes
 - Automating process for specific application
 - A dedicated user interface
 - Other services



A customized app is transforming a generic modelling and simulation platform into a specialized tool for specific needs.

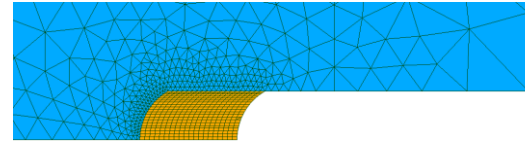
Simple example: Notch insertion tool

Insertion of a flaw (notch) with specific groups and several parameters and locations to study



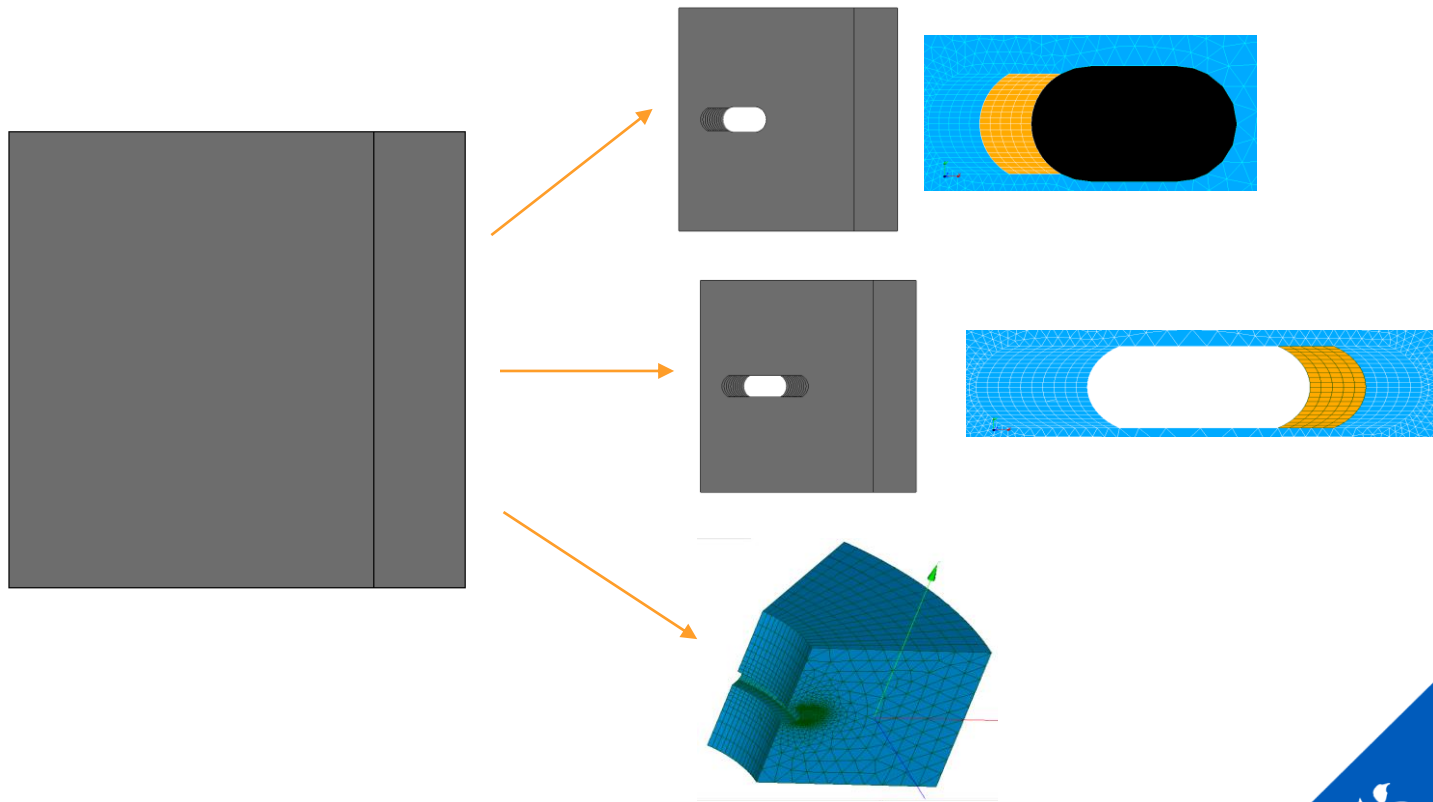
Simple example: Notch insertion tool

- Without app:
- Very time consuming (hours)
 - Human error likely
 - Not adaptable

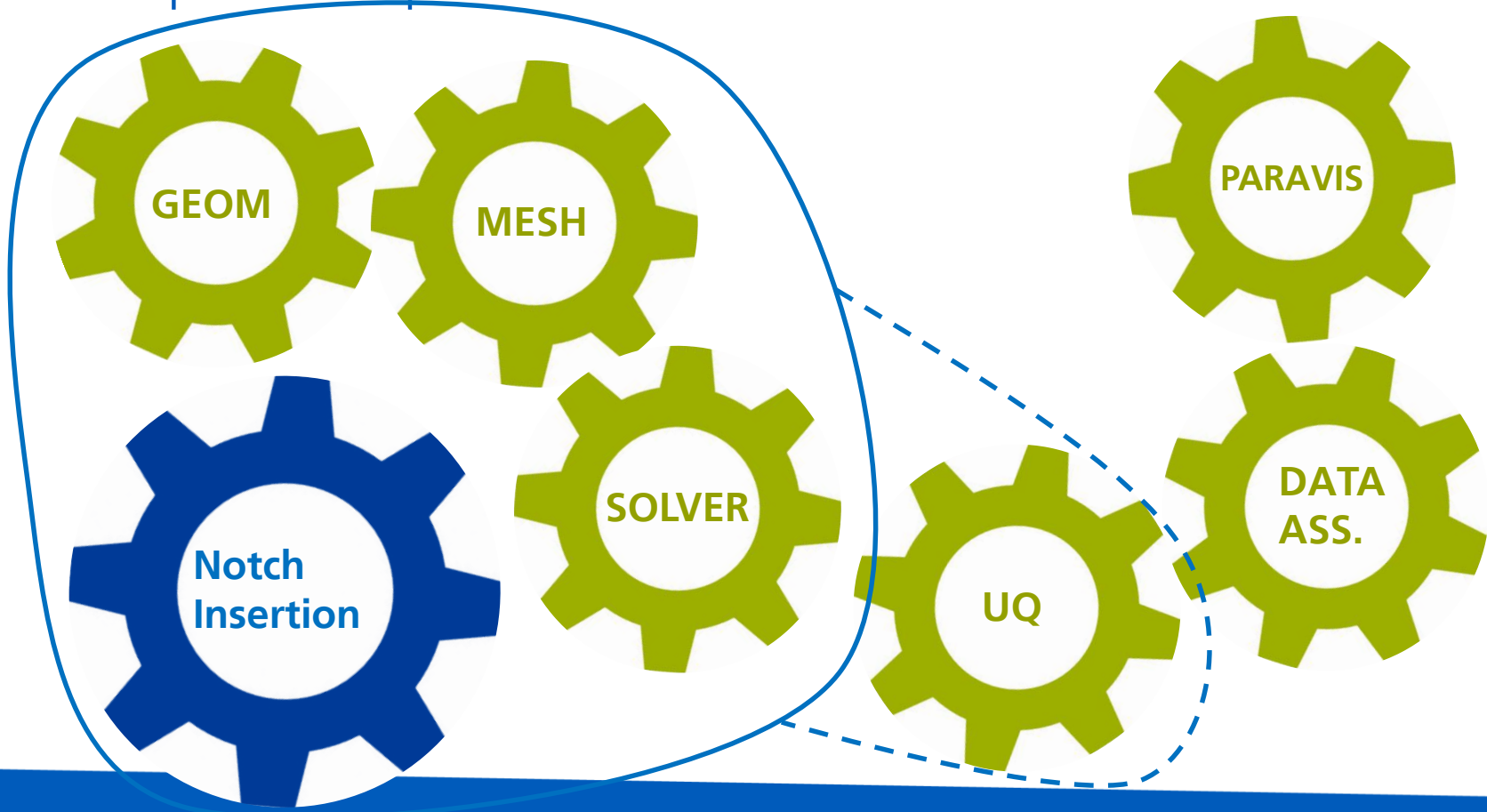


Simple example: Notch insertion tool

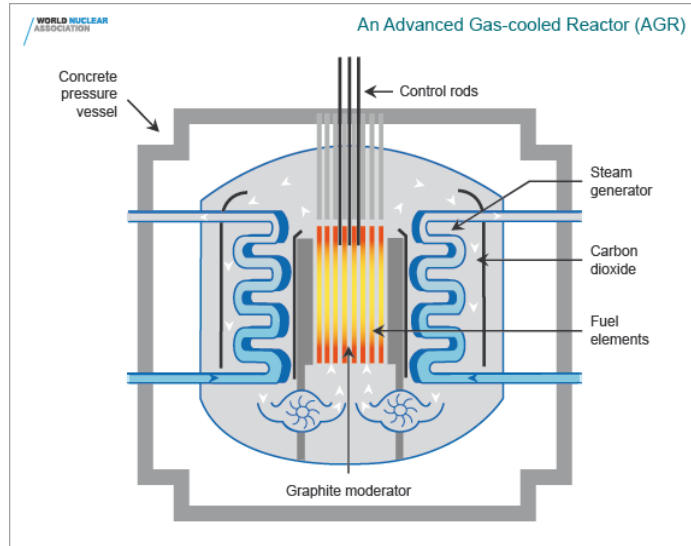
With app (python based):
-Instant (seconds)
-Limited human error
-Repeatable and adaptable



Simple example: Notch insertion tool

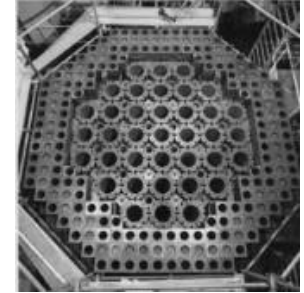


Graphite programme



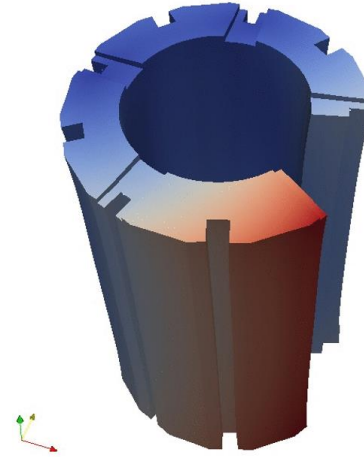
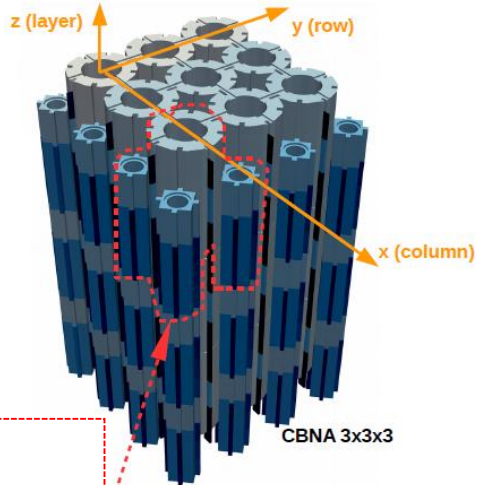
Functions of the graphite bricks

- Moderator
- Structural
- Channel for fuel and control rods



Graphite programme

Local distortion of the core due to crack opening



- 1 - Fuel Brick
- 2 - Interstitial Brick
- 3 - Filler Brick
- 4 - Interstitial Filler Key
- 5 - Loose Bearing Key
- 6 - Loose Spacer Key

Graphite programme NOT REPRESENTATIVE OF ACTUAL REACTOR BEHAVIOUR

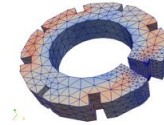
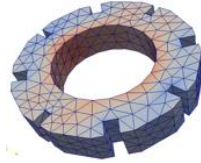
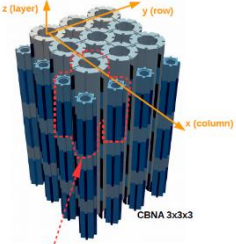
Time scale

Time scale

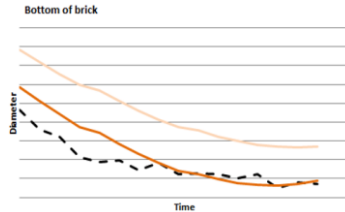
Time=0

Time=t_{crack}

Time=t_{crack2}

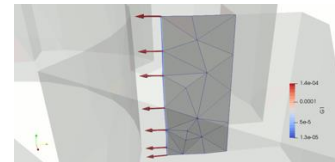


Source: BBC 2019



- Crack appears
- Is it likely to propagate or arrest?
In which conditions

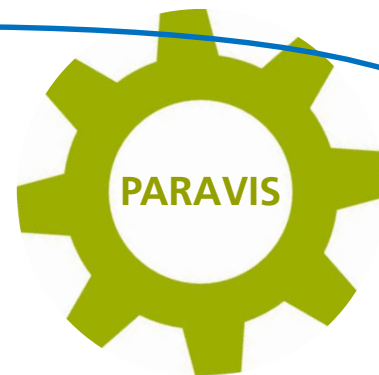
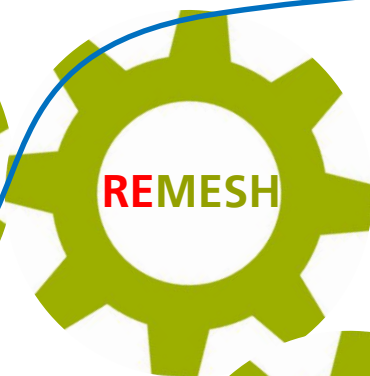
- Reinsertion of the material configuration of the cracks
- Continue the ageing analysis



Brittle materials
Elastic computation
Internal stresses generated from ageing

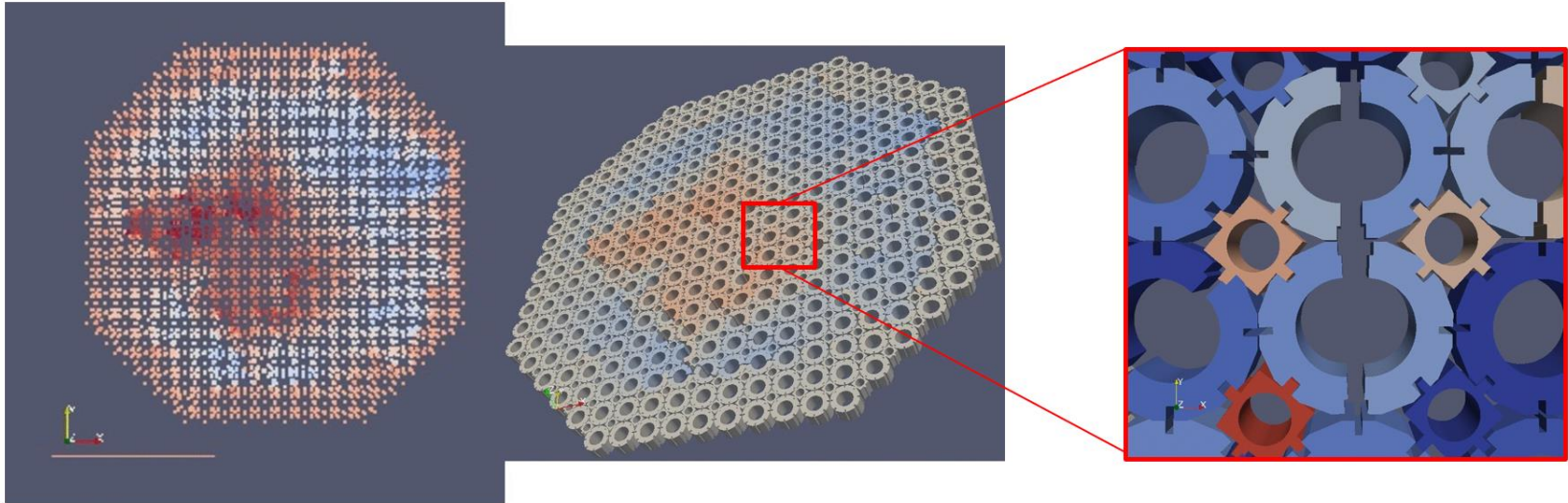


Graphite programme



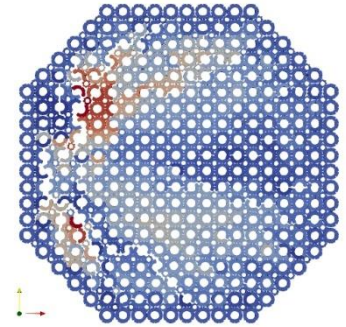
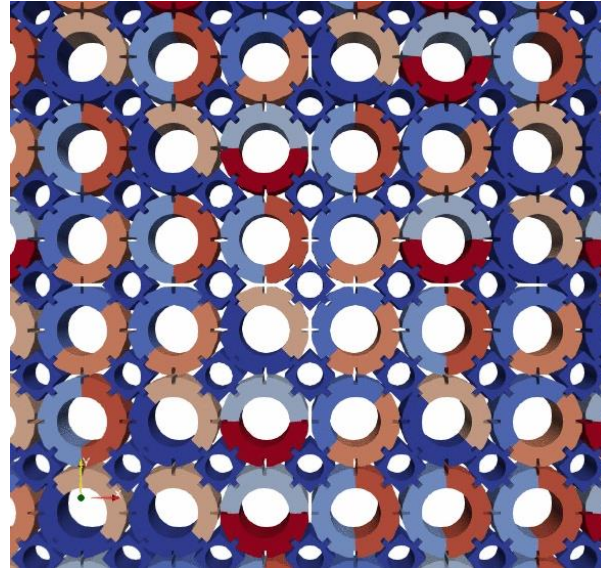
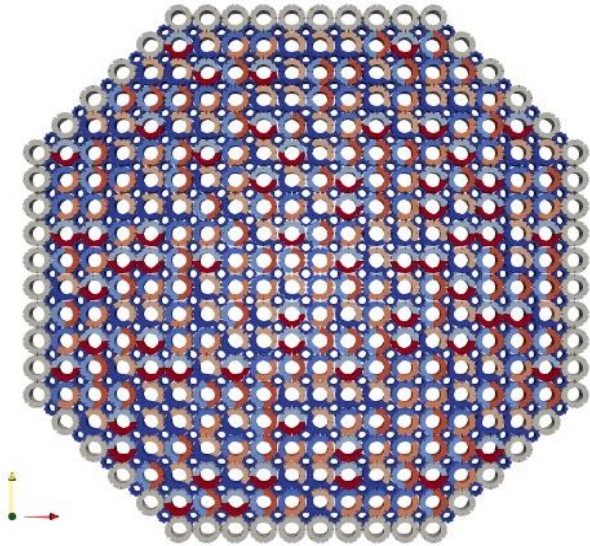
Graphite programme NOT REPRESENTATIVE OF ACTUAL REACTOR BEHAVIOUR

Whole core models: Enhanced visualisation



Graphite programme NOT REPRESENTATIVE OF ACTUAL REACTOR BEHAVIOUR

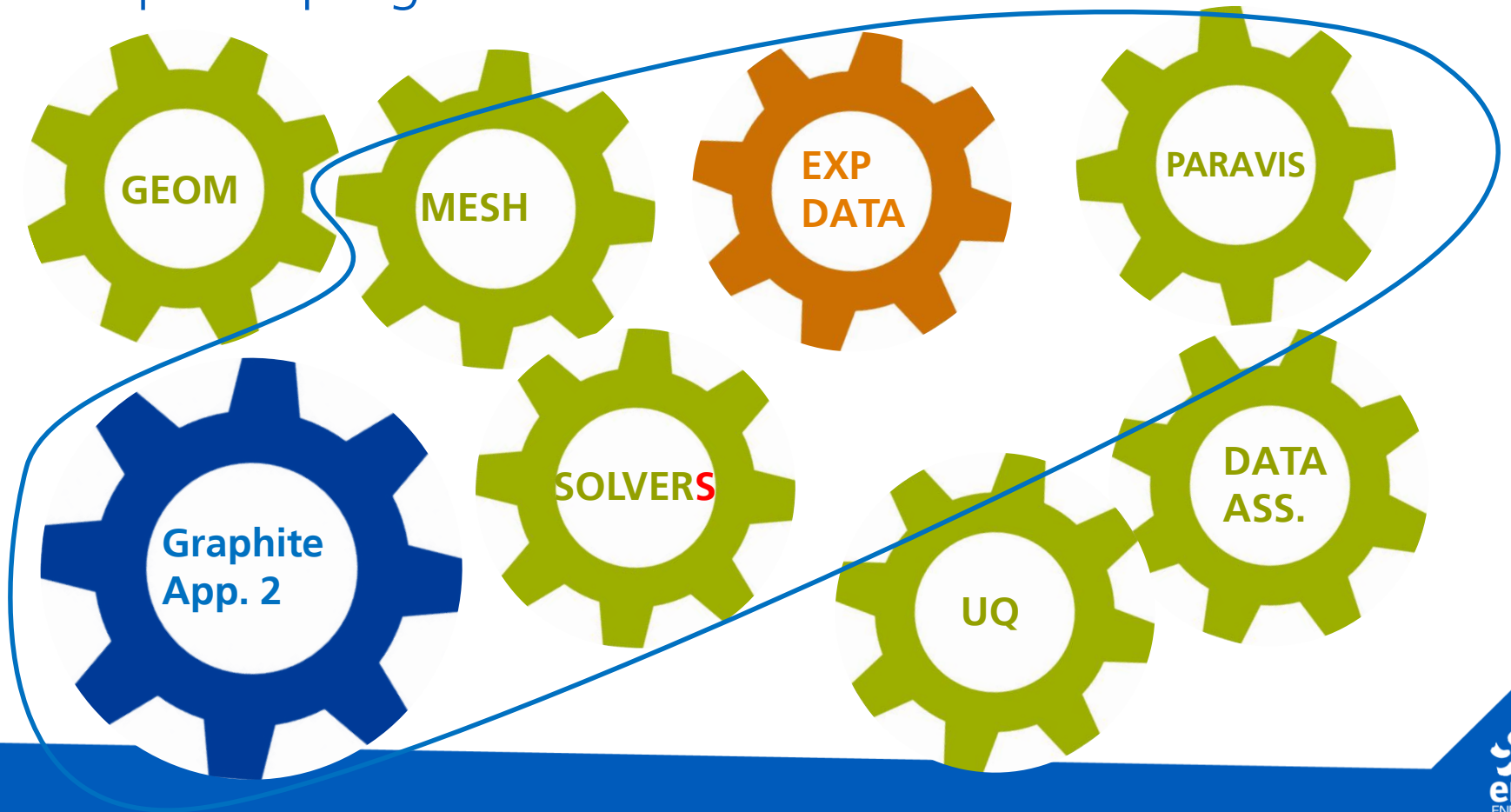
Whole core models: comparison of results coming from 10 different types of models and experiments



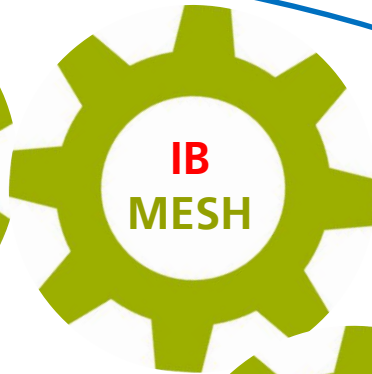
Difference

Superimposed deformed shapes

Graphite programme



IBFEM App?



Useful information

code_aster and salome_meca website:

www.code-aster.org

Next user day:

18th October 2019 (EDF R&D, Saclay)

Join the ProNet network (23 countries, 70+ partners):

contact@code-aster-pronet.org

Thank You