Code_Aster Professional Network

The Code_Aster Professional Network aims to spread and to acknowledge the benefits of Code_Aster and Salome-Meca as open-source software.


This report is the fifth issue, after the first four published since July 2015.

See previous issues http://www.code-aster.org/spip.php?article890

Summary of ProNet UPDATE 5

Meetings in France and regional meetings around the world
Support to SMEs for numerical simulation
Practical use of GNU Public License
Applications submitted by members
  • TU Wien – ANDRITZ Hydro
  • SCHÜBELER COMPOSITE - SIMSCALE
Development corner:
  • PHIMECA – EDF

Available for download

New training documents - November 27th 2016

Two new training modules were launched in 2016 with the assistance of EDF R&D training organization:
  • Introduction to development
  • HPC - Accelerating studies
The entire corpus was revamped, especially module 2 (advanced training) and module 4 (civil engineering training).

New releases - December 14th 2016

Code_Aster Open Source versions stable (12.7) and testing (13.3)

Dedicated forum for the members

The discussions conducted in the ProNet forum are dedicated to all cooperative exchanges between members of the network, expression of needs, follow-up of developments and all feedbacks.

Contact

Jean-Raymond Lévesque – Representative of Code_Aster ProNet
contact@code-aster-pronet.org

New members

2016

ALGERIA

SWITZERLAND

FRANCE

UK

MEXICO

CHILE

GERMANY

ITALY

December 2016

73 members

(see last page)
Next regular meetings in France

- **Salome-Meca and Code_Aster User’s Day 2017**
  Thursday, March 16th at EDF LAB PARIS-SACLAY

- **11th ProNet meeting 2017**
  Friday, March 17th at EDF LAB PARIS-SACLAY

Recent special meetings

- **“Numerical modelling with open source software” in Civil Engineering**
  On November 18th 2016, over ninety people participated to a workshop organized by the ORDER OF THE ENGINEERS OF THE PROVINCE OF FLORENCE at Scuola di Ingegneria. The workshop featured several contributions on Code_Aster and ProNet in Europe and other workshops are planned in Tuscany.
  Contact University of Florence mbetti@dicea.unifi.it

- **Presentation at Technical Military Academy of Bucharest**
  Students and researchers from TMA, an institution that trains Romanian military engineers, discovered Code_Aster and Salome-Meca from 21st to 25th November 2016. This presentation paved the way for the creation of a digital simulation center around Code_Aster.
  Contact ionel.nistor@edf.fr

Next regional meetings

- **Quebec user’s meeting**  
  For the third consecutive year, the University of Sherbrooke organized on Thursday May 17th at IREQ (Research Institute HYDRO-QUEBEC) a workshop on structures and mechanics of power lines for users of Code_Aster from universities, Hydro-Quebec and RTE.
  Contact sebastien.langlois@usherbrooke.ca

- **Code_Aster training session in China**
  From February 21st to February 24th 2017, EDF is organizing a Code_Aster training in Beijing jointly with the CAS (Chinese Academy of Science), open to all.
  The courses will be lectured by engineers from the EDF R&D center in Beijing accompanied by Code_Aster developers and will cover both basic functionalities as well as some advanced functionalities in dynamics and fracture mechanics.
  Contact gangchen.zhang@edf.fr and yuling.song@edf.fr

- **University of Manchester and EDF Energy**
  At the end of July 2017, a three day training session for Code_Aster is planned in Manchester (initiation and specific needs).
  Contact Philippe.Martinuzzi@edfenergy.com
Support to SMEs for numerical simulation

Several government-funded programs help small and medium-sized enterprises to integrate numerical simulation in their innovation or production processes (i.e. mechanical design, conception criteria, risk analysis...).

**Code_Aster** and **Salome-Meca** as open source solutions create multiple opportunities for this.

→ in France

**SiMCEO** coordinated by **GENCI** and **TER@TEC** offers:
- Custom-made support for the deployment or for the improvement of simulation process;
- A network of scientific and technical experts for case based approach, software training and advanced support;
- Possible access to regional computing centers;
- Public funding up to 50% of financial costs.

At present time, **Code_Aster** is implemented on two regional computer center with qualified interlocutors:

- **CRIANN** for the **NORMANDY** area
  - Contact Marie-Sophie CABOT marie-sophie.cabot@crihan.fr
  - Nicolas MERLETTE nicolas.merlette@tgdelta.com
- **CALMIP** for the **OCCITANIE** area
  - Contact Mickaël DUVAL mickael.duval@inp-toulouse.fr
  - Nadine MAROUZE nadine.marouze@inp-toulouse.fr

Other organizations are working with the same objectives:
- **Association MOSART PME** in **NOUVELLE AQUITAINE** Area
  - Contact Jean-Paul PRUHLIERE pruhliero@me.com
- **Project SIMUL PME** in **GrandEst** area
  - Contact Nicolas GARDAN nicolas.gardan@dinccs.com

>> Several service providers, members of **Code_Aster ProNet**, are interested in the accompaniment of all SMEs to use **Code_Aster** and **Salome-Meca** in Europe.

→ in Korea

**KISTI** and its Division **SMEs Innovation** is in pursuit of future growth and sustainable development of small and medium-sized enterprises. They are actively supported to enhance market competitiveness by offering a sophisticated and customized support program.

Contact Tae Ho Yoon thyoon@kisti.re.kr
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The authors of the original Program do not ensure any warranty of its operation in this new environment or software modification.

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**SALOME MECA DOCUMENTATION**

Since the release of Salome Meca 2015.2

Some documents for Utilization, Validation and Construction of assistant are now freely available

[http://code-aster.org/docsmeca](http://code-aster.org/docsmeca)

**QUALITY ASSURANCE**

After the installation of binary package Salome-Meca

a procedure may be used to verify the quality of the versions of Code_Aster packaged with it.

More information may be found in the manual SV4.02.01

Note for receipt of Salome-Meca
Applications submitted by members

**SCHÜBELEComposite : FEA of Fiber-Reinforced Plastic Parts**

Sandro PINENT - Daniel SCHÜBELE - Managers of SCHÜBELE Composite.

Schübeler Composite, founded in 1997, is a German company that is involved with the development and production of fiber-reinforced plastic parts. In their early years, they focused specifically on carbon-fiber-reinforced-polymer (CFRP) axial fans.

**Challenge**

While getting good analytical results from conventional data analysis, Sandro and his team quickly decided to go one step further with numerical analysis. For FE Analysis they first relied on Code_Aster but putting effort into the understanding of this complex program constituted a bottleneck. Knowing the advantages of the solver itself Sandro was looking for an easier way to use it. Soon Sandro realized that SimScale makes Code_Aster accessible to every other engineer in the team.

**Simulation**

The first project simulated on the SimScale platform was an analysis of the stress acting on a turbomachinery blade for model airplanes, which can also be used in motorsports or UAV engines.

The goal was to prove that the blades and mounting could withstand the operation conditions and that the design decisions taken in order to reduce the weight of the elements would not hinder the safety.

Using the step-by-step approach, at the beginning, only the blade was simulated. Static, linear analysis of the stress response of the blade to high rotation speed was analyzed. Having obtained satisfactory results, there were able to begin the investigation of the blade assembly.

This stage required using non-linear static analysis with physical contacts. Simulations measured stress response and deformation of the system to working conditions of 50 000 rounds per minute revolution speed.

In order to ensure quick analysis workflow, the first simulation was performed on a coarse mesh. After proving that the setup is correct, full-scale analysis on refined mesh was done.

**Results**

The nonlinear simulation of the blade assembly on the coarse mesh of 20 000 nodes took 24 minutes to run on 4 core machine. A refined full study was done using 95 000 nodes and took 21 minutes on 32 cores. This clearly shows the advantage of having easy access to supercomputer resources. Results obtained thanks to the simulations have proven that the weight optimized design is safe and can operate properly under working conditions.

The main advantage for SCHÜBELEComposite to use SimScale is to have a fast and simple way to get FEM calculation results, that doesn’t really require experience with Code_Aster but still provides really quick and reliable results.
Applications submitted by members

Investigation of the fluid-structure interaction of a high head Francis turbine using Open FOAM and Code_Aster

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TU Wien, Institute for Energy Systems and Thermodynamics, AUSTRIA
28th IAHR symposium on Hydraulic Machinery and Systems – 2016
Adrien TARUFFI – ANDRITZ Hydro – VEVEY - SWITZERLAND

The increasing energy consumption and highly stressed power grids influence the operating conditions of turbines and pump turbines in the present situation. To provide or use energy as quick as possible, hydraulic turbines are operated more frequent and over longer periods of time in lower part load at off-design conditions. This leads to a more turbulent behavior and to higher requirements of the strength of stressed components (e.g. runner, guide or stay vanes). The modern advantages of computational capabilities regarding numerical investigations allow a precise prediction of appearing flow conditions and thereby induced strains in hydraulic machines.

The paper above focuses on the calculation of the unsteady pressure field of a high head Francis turbine with a specific speed of \( n_q \approx 24 \text{ m}^{-1} \) and its impact on the structure at different operating conditions.

In the first step, unsteady numerical flow simulations are performed with the open-source CFD software OpenFOAM.

To obtain the appearing dynamic flow phenomena, the entire machine, consisting of the spiral casing, the stay vanes, the wicket gate, the runner and the draft tube, is taken into account. Additionally, a reduced model without the spiral casing and with a simplified inlet boundary is used.

To evaluate the accuracy of the CFD simulations, operating parameters such as head and torque are compared with the results of site measurements carried out on the corresponding prototype machine.

In the second part, the obtained pressure fields are used for a fluid-structure analysis with the open-source Finite Element software Code_Aster, to predict the static loads on the runner, with contribution of ANDRITZ Hydro Company.

In order to determine the strains on the Francis runner at different operating conditions, static FEM simulations have been performed using a cyclic sector model.

The results reveal a varying behavior regarding the magnitude and location of the maximum stresses due to different pressure distributions in the corresponding operating points. The accuracy of the static FEM simulations has been determined by a comparison with strain gauge measurements performed on the related prototype machine, revealing an appropriate agreement.
Development of module in Salome Meca

Fragility and floor spectra for seismic analysis

Previously, PHIMECA has presented a mock-up of Fragility module in Salome-Meca. Now, PHIMECA and EDF have signed a partnership agreement to jointly develop a Fragility curves and probabilistic floor spectra module which aims at helping engineers:

- To work with better ergonomics,
- To capitalize their works,
- To have a better productivity,
- To increase the quality of the studies,
- To reduce tedious and boring tasks.

The engineer has only to create a deterministic model and then Fragility module introduces uncertainties at different levels (seismic signals, soil or parameters of the structure) using Code_Aster and OpenTURNS and performs probabilistic post-processing.
Industrial and research centers, services providers and teachers are welcome

73 members - 17 countries