CERFACS

JOB OFFER – STAGE

Development of a parallel computing framework for advanced CFD analysis

OFFER INFORMATION

Reference: AAM-2024-CM-001
Team: AAM

Location: 42 Avenue Gaspard Coriolis – 31057 Toulouse

Supervisors:

- Carlos Montilla, montilla@cerfacs.fr
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Gratification: 700€ net per month - M2 level or last year at engineering school

Period: 6 months - from: 01/02/2025

Key words: Antares, CFD, Postprocessing, Python, Parallel computing

CERFACS

Cerfacs is a private research, development, transfer and training center for modeling, simulation and high-performance computing. Cerfacs designs, develops and proposes innovative software methods and solutions to meet the needs of its partners in the aeronautics, space, climate, environment and energy sectors. Cerfacs trains students, researchers and engineers in simulation and high-performance computing.
Cerfacs works closely with its seven partners: Airbus, Cnes, EDF, Météo France, Onera, Safran et TotalEnergies.

HOSTING TEAM - AAM

The Advanced Aerodynamic & Multiphysics (AAM) team is dedicated to developing cutting-edge numerical methods, physical modeling, and High-Performance Computing (HPC) techniques for new Computational Fluid Dynamics (CFD) solvers. The work focuses on fluid dynamics simulations for aircraft, rockets, and turbomachinery, in close collaboration with Cerfacs partners.

CONTEXT

Antares is a post-processing library developed at Cerfacs and extensively used by our industrial and academic partners such as Airbus and Safran Group. This python-based tool is designed for the pre-, co- and post-processing of numerical data, particularly from Computational Fluid Dynamics simulation (CFD). Antares offers a great flexibility to the users as it can read and write from many different formats used by many industrial or academic CFD codes (Fluent, CGNS, VTK, AVBP, ProLB, etc.) It also has a large set of treatments that can be applied to the data to analyze and understand many different physical phenomena in an extensive range of applications such as turbomachines, combustion chambers, aircraft aerodynamics and aeroacoustics, etc. It is for this reason that Cerfacs is committed to the continuous development and improvement of the Antares library to meet the ever-growing requests and features needed by our userbase.

MISSION

The objective of this internship is to add to Antares parallel computing capabilities for the most commonly used post-processing treatments. To this day, many of the functionalities developed in Antares can only be used in a single processor context. Therefore, the first step of the internship will be to study the algorithms implemented in the different post-processing treatments. After this, the candidate should propose one or multiple adaptations of these algorithms to be able to run them easily in a multi-processor context using the MPI standard. The performance of these new algorithms will be evaluated on academic and/or large industrials CFD simulations using the HPC facilities at Cerfacs.

DESIRED PROFILE

- The candidate has a good background in Python programming.
- A first experience in parallel programming paradigms would be highly appreciated but not mandatory.
- Knowledge in fluid dynamics would be a plus.
- Within a research framework, the candidate must be able to present their work to the research team (written or oral).

WHAT WE OFFER AT CERFACS

- Broad access to technology, a rich interpersonal environment, in-house skills recognized nationally and internationally.
- An inclusive and equitable work environment.
- A structure accessible to people with disabilities.
- Possibility of benefiting from 1.83 days of reduced working hours per month, linked to your choice of a 39-hour rather than 35-hour working week.
- 50% reimbursement of public transport costs.

HOW TO APPLY ?

To apply, please send your CV and covering letter to montilla@cerfacs.fr , applications are open until 31/01/2025.

See you soon at CERFACS!