exaFOAM: Exploitation of Exascale Systems for Open-Source Computational Fluid Dynamics by Mainstream

Description

The ambitious exaFOAM project aims at overcoming the current limitations of Computational Fluid Dynamics (CFD) technology, especially in what concerns the exploitation of massively parallel HPC architectures. This will be undertaken through the development and validation of a range of algorithmic improvements, across the entire CFD process chain (preprocessing, simulation, I/O, post-processing). Effectiveness will be demonstrated via a suite of HPC Grand Challenge and Industrial Application Challenge cases where engineering design through CFD has contributed strongly to industrial competitiveness and sustainability across a wide range of sectors (e.g. transportation, power generation, disaster prevention).

All developments will be implemented in the open-source CFD software OpenFOAM, one of the most successful open-source projects in the area of computational modelling, with a large industrial and academic user base. To ensure success, the project mobilises a highly capable consortium of 12 partners/beneficiaries consisting of experts in HPC CFD algorithms and industrial applications and includes universities, HPC centres, SMEs and code release authority OpenCFD Ltd as a linked third party to the PI. Project management will be facilitated by a clear project structure and quantified objectives to enable tracking of the project progress.

Special emphasis will be placed on ensuring a strong impact of the exaFOAM project. The project has been conceived to address all expected impacts set out in the Work Programme. All developed code and validation cases will be released as open-source to the community in coordination with the OpenFOAM Governance structure. The involvement of 13 industrial stakeholders and 5 industrial supporters from outside the consortium underscores the industrial relevance of the project outcomes. A well-structured and multi-channelled plan for dissemination and exploitation of the project outcomes further reinforces the expected impact.