Towards next generation of industrial aerodinamical simulation tools

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O. Lehmkuhl1, E. Valero2 and j. pons 3

1 Barcelona Supercomputing Center

Plaça Eusebi Güell, 1-3, 08034 Barcelona (Spain)

oriol.lehmkuhl@bsc.es , <https://www.bsc.es>

2 ETSIAE-UPM - School of Aeronautics, Universidad Politécnica de Madrid.

Plaza Cardenal Cisneros 3, Madrid E-28040, Spain

[eusebio.valero@upm.es](mailto:eusebio.valero@upm.es)

3 Aeronautical Engineering Dpt. CIMNE

Campus PMT-UPC C/ Esteve Terrades, 5, 08860 Castelldefels, Spain

[jpons@cimne.upc.edu](mailto:jpons@cimne.upc.edu) . http://www.cimne.com/

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ABSTRACT

Aviation contributes to more than 2% of global greenhouse gas (GHG) emissions and its activity is increasing exponentially. In the absence of further measures, carbon dioxide (CO2) emissions from international aviation are estimated to almost quadruple by 2050 compared to 20101. The scientific community and the aeronautical industry have the obligation to create new and more efficient designs. In the process of obtaining new and more efficient products, numerical simulation (such as Computational Fluid Dynamics, CFD) is becoming a key player in aeronautical design, which will mark the difference between success and failure. However, in despite of the current deployment CFD during the design process, there is a need to increase the capabilities of current numerical simulation tools for aeronautical design by re-engineering them for extreme-scale parallel computing platforms. By doing so, the aerospace industry will be able to expand the use of HPC (High-Performance Computing) in the design loop, which is essential to meet the performance and environmental targets proposed in the European Union.

The present mini symposium will be focused on the efforts of the NextSim consortium to address this challenge (however is open to other researchers addressing the same challenges). NextSim consortium focusses on classic finite volume and new highly accurate high order discontinuous Galerkin schemes (HoM), all specifically tailored for aeronautical applications. The topics of interest are related to improving the convergence of current numerical algorithms; adaptive mesh refinement algorithms; increase the maturity of HoM; overcome barriers to achieving extreme scale computing (load balancing, communication patterns, GPU integration, etc.); development of algorithms for data management, visualisation and modelling and benchmarking of large-scale aeronautical applications.