EXCELLERAT P2

The European Centre of Excellence for Engineering Applications

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WHAT IS EXCELLERAT?

The EXCELLERAT project is a single point of access for expertise on how data management, data analytics, visualisation, simulation-driven design and Co-design with high-performance computing (HPC) can benefit engineering, especially in the aeronautics, automotive, energy and manufacturing sectors.

WHAT IS THE GOAL?

EXCELLERAT aims to tackle the ever-rising complexity of scientific and development endeavours. Thus, Exascale computing is our focus, which will solve highly complex and costly engineering problems, and create enhanced technological solutions even at the development stage. The goal of EXCELLERAT is to enable the European engineering industry to advance towards Exascale technologies and to create a single entry point to services and knowledge for all stakeholders (industrial end users, ISVs, technology providers, HPC providers, academics, code developers, engineering experts) of HPC for engineering. In order to achieve this goal, EXCELLERAT brings together key players from industry, research and HPC to provide all necessary services.

HOW CAN EXCELLERAT PROVIDE THE BENEFITS OF HPC TO THE ENGINEERING INDUSTRY?

The biggest benefit of HPC is to increase the processing speed, which enables businesses to deliver faster results and save more money.
Some examples of the work that HPC can handle include:

- Enhanced Design and Manufacturing Process
- Enhanced Streamline Processes
- Enhanced Supply and Demand Processes

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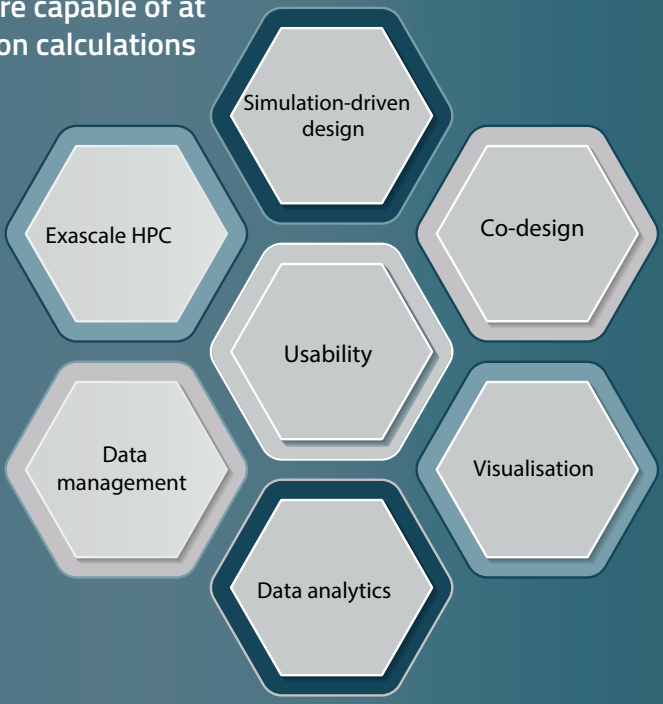
Knowledge Hub & Expertise

EXCELLERAT brings together the necessary European expertise to establish a Centre of Excellence in Engineering with a broad service portfolio, paving the way for the evolution towards Exascale. By Exascale computing, we refer to computing systems that are capable of at least one exaflop, or quintillion calculations per second.

EXCELLERAT is part of the European HPC Strategy realisation, just pushed forward with the activities on the EuroHPC Joint Undertaking.



In a holistic approach, EXCELLERAT analyses and optimises eight core codes according to the engineering lifecycle. On the following pages you can find more about these codes.

You can find our Service Portal here: ***https://services.excellerat.eu/***

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CODES

Alya

Alya is a high performance computational mechanics code to solve complex coupled multi-physics / multi-scale / multi-domain problems, which are mostly coming from the engineering realm. Among the different physics solved by Alya we can mention: incompressible/compressible flows, non-linear solid mechanics, chemistry, particle transport, multiphase problems, heat transfer, turbulence modeling, electrical propagation, etc. Alya is one of the two CFD codes of the Unified European Applications Benchmark Suite (UEBAS) as well as the Accelerator benchmark suite of PRACE.

AVBP

AVBP is a compressible fine element Navier Stokes solver dedicated to reactive flows. Using the cell-vertex approach, it is capable of solving complex gaseous and two phase-flow problems covering academic and industrial applications. AVBP is at the state of the art of high performance computing and computational fluid dynamics modelling.

Coda

CODA is a Computational Fluid Dynamics (CFD) software for the solution of the RANS equations on unstructured grids based on second-order finite-volume and higher-order Discontinuous-Galerkin (DG) discretizations. The implementation addresses the efficient utilization of current and upcoming high performance computing clusters. CODA is being co-developed by Airbus, ONERA (the French Aerospace Lab), and the German Aerospace Center (DLR), offering the possibility of contributions from further partners on the basis of individual agreements.

ElmerFEM

Elmer is a finite element software for multiphysical problems published under open source. Elmer is mainly but not exclusively developed by CSC – IT Center for Science. The purpose of this site is to host services for the benefit of the user community.

CODES

FLEW

FLEW is a finite-difference code designed for high-fidelity solution of compressible turbulent flows using single-block, structured, curvilinear meshes. The solver incorporates state-of-the-art numerical algorithms to cope with high-speed flows and turbulence, which rely on nonlinearly stable central discretization, and resorting to artificial viscosity in shocked regions only.

m-AIA

m-AIA (multi-physics AIA) is a multi-physics partial differential equation (PDE) solver framework with a focus on problems related to computational fluid dynamics, computational aeroacoustics and structural mechanics. It is developed at the Chair of Fluid Mechanics and Institute of Aerodynamics (AIA) at RWTH Aachen University in Germany.

Neko

Neko is a portable framework for high-order spectral element flow simulations. Written in modern Fortran, Neko adopts an object-oriented approach, allowing multi-tier abstractions of the solver stack and facilitating various hardware backends ranging from general-purpose processors, CUDA and HIP enabled accelerators to SX-Aurora vector processors.

OpenFOAM

OpenFOAM is the free, open source CFD software developed primarily by OpenCFD Ltd since 2004. It has a large user base across most areas of engineering and science, from both commercial and academic organisations. OpenFOAM has an extensive range of features to solve anything from complex fluid flows involving chemical reactions, turbulence and heat transfer, to acoustics, solid mechanics and electromagnetics.

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