EXCELLERAT

The European Centre of Excellence for Engineering Applications

EXCELLERAT

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 HIGH-PERFORMANCE COMPUTING (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

www.excellerat.eu

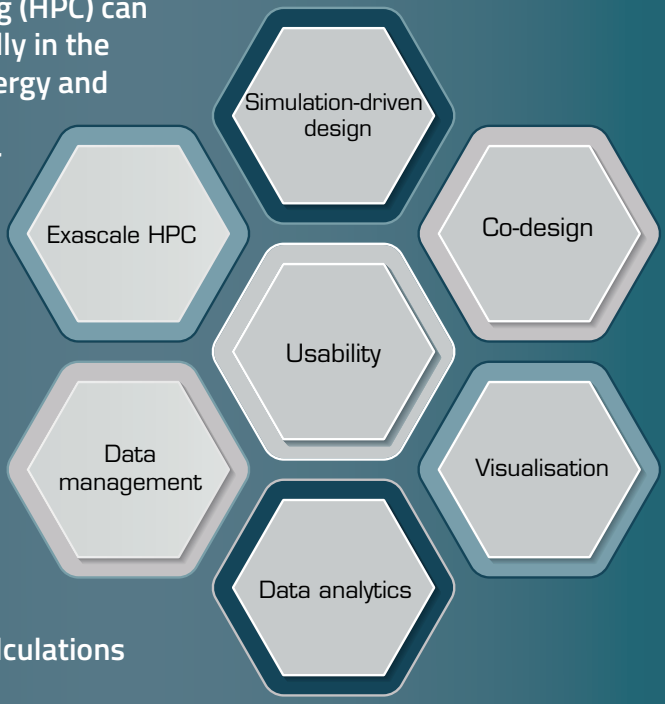
@EXCELLERAT_CoE EXCELLERAT

The European Centre of Excellence for Engineering Applications

EXCELLERAT

SERVICE OFFERINGS

EXCELLERAT provides knowledge and 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. EXCELLERAT brings together the necessary European expertise to establish a Centre of Excellence in Engineering with a broad service portfolio in the following areas, 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 six 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: *www.services.excellerat.eu*

EXCELLERAT

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.

Developer: BSC
Application Area: Multiphysics, Aerospace, Automotive, Marine
Linked Companies: Idiada, EM Combustion, iVascular, IHT, Seat, Repsol, Iberdrola, Medtronic, Siemens AG, General Electric

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.

Developer: CERFACS
Application Area: Aerospace, Automotive, Combustion, Compressible Two-Phases Flows
Linked Companies: SAFRAN Group, TOTAL, CNES, Ariane Groupe

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.

Developer: DLR
Application Area: Aerospace
Linked Companies: Airbus

EXCELLERAT

CODES

FeniCS

FEniCS is a high-level problem-solving environment for automated solution of partial differential equations (PDEs) by the finite element method. FEniCS takes the weak form of a PDE as input in a near mathematical notation and automatically generates low-level source code, abstracting away implementation details and HPC concepts from domain scientists.

Developer: CINECA
Application Area: Multiphysics, Aerospace, Automotive, Energy, Renewables

TPLS

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.

Developer: School of Engineering at The University of Edinburgh and of the; School of Mathematical Sciences, University College Dublin
Application Area: Parallel sustainability - Mathematical modelling of complex fluid flows

NEK5000

TPLS (Two-Phase Level Set) is a 3D Direct Numerical Simulation (DNS) package that simulates multiphase flows. It utilizes MPI, PETSc and Fortran subroutines. The TPLS solver is highly parallelisable and can simulate flows at ultra high resolution (> 30 million grid points).

Developer: KTH
Application Area: Aerospace, Automotive, Energy, Renewables
Linked Companies: Scania, Tetra Pak, Agusta Westland

www.excellerat.eu

@EXCELLERAT_CoE EXCELLERAT

The EXCELLERAT project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 823691