



epcc

POWERING BUSINESS

# High Performance Computing

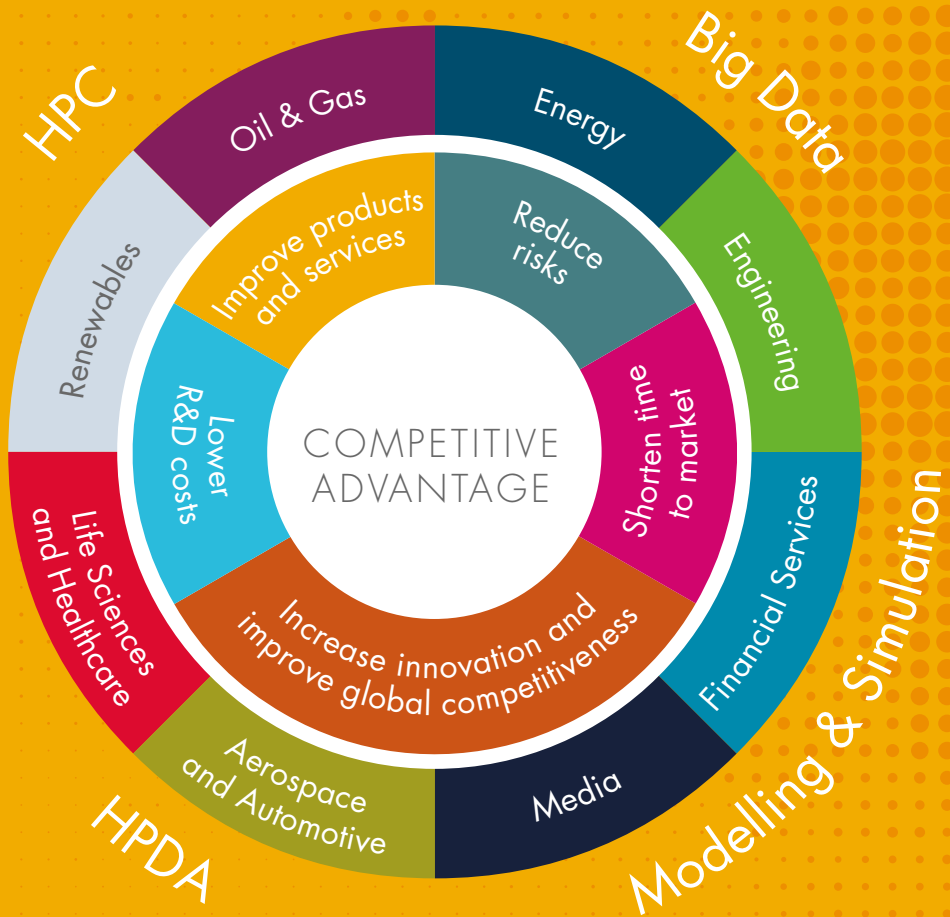
With High Performance Computing (HPC), tasks that take months on a standard desktop computer can be accomplished in hours or even minutes. Using parallel processing to deliver unprecedented computing capability, HPC unlocks new frontiers of problem solving, prediction and data analysis.

Today, organisations of all sizes are using HPC. Global enterprises, SME's & start-up's use it to help develop, manage and scale their product development and manufacturing efforts, to evaluate financial risks, and to develop new business insights. Research and academic institutions use it to run calculations and simulations at scales that were previously impossible, accelerating new discoveries.

The applications of HPC are broad ranging. For example, modelling and simulation technologies can be used to explore many aspects of a new product before it's built, helping you to find exactly the right design before spending money on prototyping. From microscopic lab sample analysis to global supply chains, no business is too small or too big to benefit from advanced modelling and simulation. HPC is also found in domains such as rendering for media and entertainment, genomics and proteomics analysis for life sciences and healthcare, oil and gas reservoir simulation for energy exploration, financial risk analysis, molecular dynamics, weather prediction, and many more. Supercomputers and computer clusters can be used to solve advanced computation problems. HPC enables public and private organisations to make new discoveries, create more reliable and efficient products and gain new insights in an increasingly data- intensive world.

# HPC & Data Science

Increasingly HPC is being combined with new techniques in Data Science to address large scale & complex Data challenges. HPC can be a key tool in unlocking real value from data – creating new structures and relationships, dramatically speeding up AI models, discovering deeper and more valuable insights, and generating important correlations, patterns and relationships. Combining HPC with rapidly evolving Data Science methods and toolkits such as MapReduce/Hadoop, graph analytics, machine learning and semantic analysis can open-up new horizons. Examples can be found in fields such as cryptography, optimising portfolios in financial services, and developing personalised medicines in healthcare programmes by combining analysis of mass patient records with computational methods in genomics and next generation sequencing.





# EPCC The UK's Leading HPC Centre

Based at the University of Edinburgh, EPCC is the UK's only HPC centre with a global reputation. Since its inception in 1990, EPCC has gained an enviable reputation for leading edge capability in all aspects of HPC. EPCC is built on three key foundations: the hosting, provision and management of high performance HPC and data facilities for British and European academia and business; research and consultancy to support the computing activities of those organisations; and the creation of novel and high-performance software solutions for industry and commerce.



Building strong collaborations with key HPC players further reinforces EPCC's leadership position. As an Intel Parallel Computing Centre (IPCC), we are working with Intel to optimise a range of large-scale simulation codes for Intel Xeon and Xeon Phi processors. We are collaborating with Cray through the Exascale Technology Centre to explore new ideas and new technologies to meet the challenges of delivering Exaflop performance within the next decade. As an NVIDIA GPU Research Centre & NVIDIA AI Technology Centre partner, we are undertaking pioneering work in the area of GPU computing & Artificial Intelligence. Through our leadership of several major European projects such as Fortissimo, and collaborations at a national level with Scottish Government, UKRI & The Alan Turing Institute we are proactively accelerating the adoption and value of HPC across a range of industrial sectors.

Our facilities and expertise are unmatched in Europe. With over 110 highly qualified permanent staff, EPCC has an exceptional pool of talent. Our engineers and technical staff have a balanced blend of theoretical, academic and practical knowledge and many have worked in industry before joining EPCC.

## EXPERTISE

- Large-scale Computational & Data Techniques
- Code Parallelisation & Optimisation
- Advanced & Novel HPC Architectures
- Parallel Programming
- Cloud & Grid computing

## UNRIVALLED SERVICES

- Computational Modelling & Simulation
  - Data Management & Analytics
  - Access to HPC & Facilities
  - Software Development
  - Training & Consultancy

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## PEOPLE

- Exceptionally talented staff – Computational /Data Scientists, Engineers, Mathematicians & Physicists
- Powerful combination of practical and theoretical knowledge
- Extensive industry experience



# Services & Solutions for Business

## **HPC On-Demand: Access and Data Facilities**

Cost of entry is arguably the biggest barrier restricting the uptake of HPC. Our on-demand service eliminates the requirement for capital expenditure by giving you access to our HPC and associated facilities, as and when you need them. Known as “Accelerator”, this service is fully scalable and its fully flexible “pay as you go” pricing model provides an affordable entry point to capabilities that have the potential to transform your business.

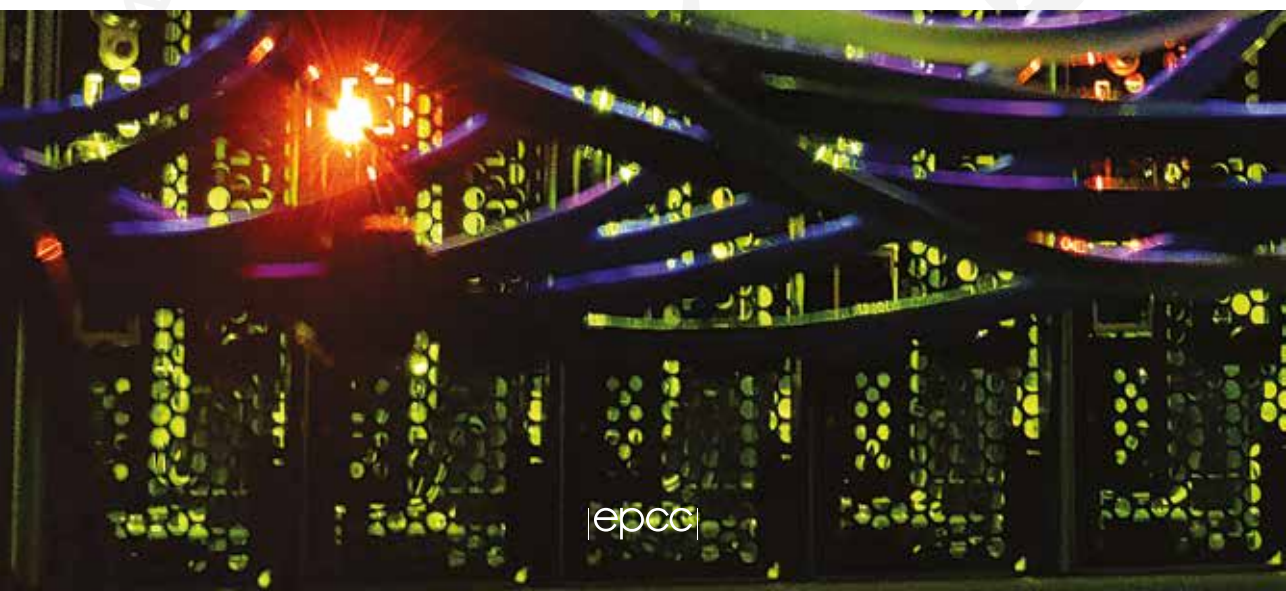
## **Collaboration**

As well as working for you, we’re always looking for opportunities to work with you – to collaborate on new codes, applications and other innovative projects that can contribute to the ongoing development of the high-tech, knowledge led economy. Spanning the spheres of hardware and software, we offer a skills-rich, imaginative environment where industrial, academic and other organisations can collaborate with us and each other to drive new ideas forward, test concepts and assess the market potential of innovative products and services.

Collaborations can take many forms and are funded through a variety of mechanisms that include the European Commission, UK Research Councils, Scottish Enterprise and industry. Many of our current research activities are focused on developing the next generation of software tools and methods for use at the exascale.

## **Data Management and Analytics Services**

Our Supercomputers have vast storage space and their multi-core processing power means that they can quickly convert your data into meaningful business intelligence. We have expertise in distributed computing (with a focus on service-oriented and Cloud computing) as well as data integration and data analytics. We can also give honest and impartial advice on the best available commercial and open-source solutions.



## Computational Modelling and Simulation

Modelling and simulation are popular methods of designing, developing and testing tomorrow's products and services. Analysis using FEA or CFD application packages has become standard for most manufacturing companies. However, many simulation codes do not scale beyond a few tens of processors, meaning that attempts to run them on HPC systems will either fail completely or result in the code running slower. We are experts in tackling scaling problems. We can improve the scaling of in-house and ISV codes through optimisation and re-engineering so that companies can undertake faster and larger simulations.

## Consultancy

For more than three decades we have provided consultancy and software development services to industry and commerce. Our independence from hardware and software vendors means that our solutions are impartial and deliver the best value for money. Our clients range from start-ups, through to small and medium sized companies and multinationals.

## Software Development and Optimisation

One of our core objectives is to develop, demonstrate and deploy software that can scale to the largest new and next generation computing architectures. Whether writing new algorithms or optimising existing code, we open the door to the handling of ever vaster datasets and the exploitation of unprecedented sophisticated modelling and simulation capabilities.

We can help you to enhance your existing software and push new products and services forward. Our HPC systems and modelling and simulation capabilities, together with our supporting expertise, will also deliver the problem-solving skills you need in order to create and innovate on a whole new level.

## Training

Users, developers and business managers can all benefit from EPCC's highly regarded training courses. We are Europe's leading HPC training centre and our courses can be tailored to suit your requirements. All our training courses are delivered by highly experienced HPC practitioners and provide both theory and practical sessions to maximise learning impact.

# Unparalleled Facilities

## EPCC Systems

EPCC hosts and manages a unique collection of leading-edge HPC systems and data resources at the University's Advanced Computing Facility (ACF), a secure state-of-the-art facility located on the outskirts of Edinburgh. Our large computing power combined with huge data storage capacity distinguishes us from all other UK-based HPC facilities, commercial and non-commercial alike.

### TOP 500\* SUPERCOMPUTERS

- ARCHER – UK National Supercomputing Service (Cray XC30)
- IBM Blue Gene/Q

### STANDARD CLUSTERS

- Linux
- Windows
- GPU & other accelerators

### LARGE-SCALE DATA INFRASTRUCTURE

- Multi-Petabyte Data Storage
- Backup
- Archive

### ON DEMAND ACCESS

- Secure
- Easy to Use
- Cost Effective

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[www.top500.org](http://www.top500.org)





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# Accelerator

## On-Demand Computing

Our on-demand computing service is called "Accelerator" and brings leading edge HPC capability directly to your desktop. "Accelerator" is targeted at engineers and scientists solving complex simulation and modelling problems in fields such as Materials Chemistry, Computational Fluid Dynamics, Finite Element Analysis, Life and Earth Sciences.

Through a simple ethernet connection you gain cost-effective access to a range of large-scale, multi-core, high-end compute resources:



**ARCHER 2:** access to over 740,000 cores of high -end compute, ideal for solving large-scale simulation and modelling challenges across a range of computational science disciplines.



**Cirrus:** access to 10,000 cores & over 140 GPU's for solving extremely complex modelling and data science problems. Cirrus is an ideal platform for running user's own code or large-scale open source codes such as OpenFOAM.



**EIDF:** Underpinning the Edinburgh City Region Deal this world-class infrastructure provides a unique environment for data scientists including a variety of toolkits, software and data storage & management resources.



**RDF-as a service:** Large-scale data facility provides access to petabyte scale data storage and archive facilities.

A C C E L E R A T O R



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THE UNIVERSITY  
of EDINBURGH

**CRAY**

The Cray Centre of Excellence and  
The Cray Exascale Technology Centre

Intel® Parallel  
Computing Center  
(Intel® PCC)



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