

Fortissimo launches service to broker HPC resources

The Fortissimo marketplace and its parent company emerged from a successful EU-funded initiative, writes **Robert Roe**

Engineers and scientists can now get access to HPC resources more easily because of the Fortissimo Marketplace, a new platform for brokering high-performance computing (HPC) services. The new cloud-based marketplace offers small manufacturing businesses fast and convenient access to supercomputing services.

Professor Mark Parsons, project coordinator for the Fortissimo project, stated: 'We know companies that use high-performance computing and high-performance data analytics seek really clear

economic and business benefits from doing so. However, we also know that far too few companies actually use these technologies.'

The Fortissimo marketplace and its parent company emerged from a successful EU-funded initiative, the Fortissimo Project. The project is a collaborative venture to enable European SMEs to be more competitive through the use of simulation services running on high-performance computing cloud infrastructure.

Using simulation and modelling on high performance computing systems is widely seen as an effective but very expensive design

and development tool – only accessible to the largest and most financially powerful companies. The Fortissimo project aims to change this, lowering the barrier to entry for new, commercial HPC users, so that they can derive the benefits of HPC without the huge investment in infrastructure or the necessary skills to run and maintain an HPC cluster.

'When we ask companies why they are not using these technologies and software solutions, a common answer is that its very expensive, "we lack the skills to do it", "we can't do it in-house", and "we wouldn't know where to start"' commented Parsons. In 2013, IDC analysts estimated that each dollar invested in HPC returned, on average, \$356 in revenue and \$38 in profits or cost savings.

'Fortissimo is all about helping companies to take their first steps in using modelling

CASE STUDY: CLOUD-BASED ADDITIVE MANUFACTURING

HSL is a hi-tech centre for the development of new products. With hundreds of products handled over the years, the company has developed experience with materials, traditional and innovative manufacturing technologies, prototyping, dies and moulding. HSL is an SME and a market leader in both additive manufacturing and the rapid production of prototypes. In recent years additive manufacturing has emerged as a viable mainstream production technology.

Overcoming technical and bureaucratic obstacles has allowed 3D printing to grow as a cost-effective option for small and medium scale production, together with the ability to produce complex shapes not achievable by standard manufacturing processes. This flexibility in design enables

the optimisation of components, a reduction in manufacturing time by almost a third and a halving of production costs by reducing the waste of materials and energy.

The challenge

Despite the clear advantages of additive manufacture, current design tools have been developed for traditional manufacturing procedures and are not flexible enough. This limits the potential of 3D printing. CAE tools are able to suggest new shapes and accurately predict the behaviour of components, making them a natural choice in the design chain. However, and especially when dealing with complex computational fluid dynamic (CFD) simulations, shape optimisation can be a prohibitively expensive task for

SMEs. The objective of this case study is the development of an optimisation service. The goal is to demonstrate the validity of such a service by optimising a prospective industrial artefact, a Lamborghini 12-cylinder airbox.

The solution

Numerical grid parameterisation using a mesh morpher avoids the time-consuming task of mesh generation (that can take up to 70 per cent of the total analysis cost).

THE ECONOMIC BENEFIT IS ESTIMATED TO BE BETWEEN €40,000 AND €70,000 PER YEAR

Access to CFD simulation through the Fortissimo HPC Cloud allows a further speed-up in calculation times, reducing the time to market and to return on investment. Using a collaborative, interactive, cloud interface helps analysts and clients to work together and to be integrated in the value chain, increasing customer satisfaction and building better products more effectively.

The development cost of a new air-box, estimated as €250,000 using a standard approach, can be reduced to €75,000 using the HPC cloud service. Based on a forecast that, over the next two years, HSL will undertake three new air-box optimisations each year and that, compared with traditional CAD methods, there is a cost saving of €175,000 per optimisation,

and simulation to improve their business processes and their products,' said Parsons.

The Fortissimo Marketplace is designed to take the complexity out of the process of procuring high-performance simulation and modelling. Through either turn-key packages or Fortissimo's matching service, SMEs from a broad range of markets – including automotive, aviation, medical engineering, manufacturing, the energy and environmental sectors – can gain access to advanced simulation and modelling services operating on a cloud infrastructure.

The Fortissimo project has already conducted more than 50 experiments within the pilot phase of Fortissimo Marketplace. As a result of its Fortissimo experiment, IES, a leading building-performance modelling company, can now run simulations in hours instead of days, and at half the cost of an in-house system capable of delivering the same results. Similarly, supercar manufacturer Koenigsegg recouped its investment in HPC experimentation with Fortissimo in less than three months – corresponding to a 1.5 per cent reduction in overall development costs of its new Koenigsegg One:1 supercar.

In the second stage of the Fortissimo project, which was initiated in November 2015, more than 30 experiments have been started. Successfully concluded experiments become case studies, which are

made available to other users through the Fortissimo Marketplace to inspire evaluation of HPC simulation.

Fortissimo was first launched as a project funded by the European Commission within the I4MS initiative (ICT Innovation for Manufacturing SMEs) framework. The aim of this project is to strengthen the global competitiveness of small- and medium-sized enterprises (SMEs) in Europe. To do this, Fortissimo uses a cloud-infrastructure to provide SMEs from different vertical markets – including automotive, aviation,

THE FORTISSIMO PROJECT AIMS TO LOWER THE BARRIER TO ENTRY

medical engineering, manufacturing, and the energy and environment sectors – with easy access to computationally intensive digital simulations.

The Fortissimo project consists of two phases: the first phase started in July 2013 and ends in December 2016. Fortissimo 2 began in November 2015 and ends in October 2018. The budget for the first phase of the project totals €21.7 million, €16 million of which was provided by the European Commission within the

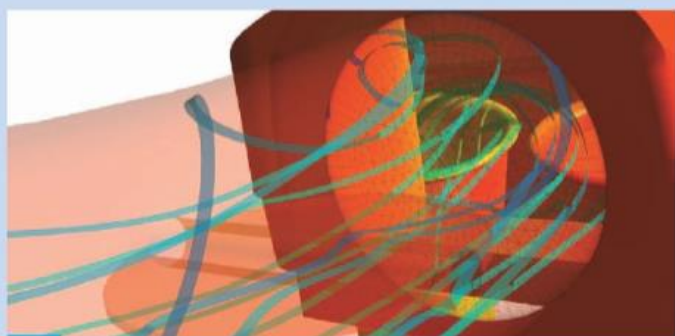
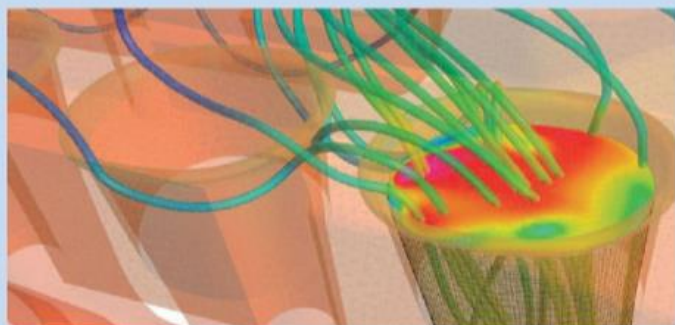
framework of the I4MS initiative. Fortissimo 2 has a budget of €11.1 million, €10 million of which is again provided by the European Commission within the frame of the I4MS initiative.

So far the project has 15 core partners, consisting primarily of IT solution providers and HPC Cloud service providers, which serve as the leading support for the Fortissimo Project. The core partners are: Arctur, Atos, Bull SAS, CESGA, Cineca, GENCI, Gompute, INRIA, Intel, Scapos, Sicos, SURFsara, the University of Edinburgh (EPCC, the project coordinator), the University of Stuttgart (HLRS) and XLAB.

A more in-depth look at the Fortissimo success stories can be found on the Fortissimo website.

Fortissimo is currently running a call for proposals for the next batch of experiments to be run as part of the project. This call is particularly focused on what it describes as mid cap SMEs, defined as companies with a maximum of 2,000 employees and an annual turnover below €400 million. Priority will also be given to companies that are 'first time' HPC users.

The deadline for submissions as part of this latest call is the 7th December 2016. More information on this process can be found under the latest call for proposal on the company's website. ●



Modelling a Lamborghini 12-cylinder airbox

the annual saving is equivalent to €525,000.

The benefits

HSL expects that the new service will see the development of a business department with two to three staff, potentially growing to five to six staff after three to four years. For UTV it is estimated that, thanks to the new know-how acquired, the relevant department will increase its industrial research services. The economic benefit is estimated to be between €40,000 and €70,000 per year in a five-year plan. Finally, this case study comprises a success story for CINECA, in the application field of high fidelity CFD, which is estimated to bring in at least two new SME customers per year, with an approximate five per cent increase

in revenue for commercial services.

Having access to the RBF Morph morphing tool – combined with CFD analysis powered by HPC – opens a wide range of business opportunities. In parallel with existing rapid prototyping services, HSL can now propose to its clients alternative component designs corresponding to appropriate performance indicators. For HSL, offering a shape optimisation service, in parallel with its existing core business of rapid prototyping activities, represents an opportunity to establish customer activity over a range of key R&D areas. HSL is ready to offer the developed tool to a range of existing clients in the automotive industry, anticipating for the next two years – a total revenue growth of 16 per cent per year in that sector. ●