

Cloud-based simulation of the hydrodynamic resistance of ships' hulls in the presence of waves

Fortissimo Experiment Facts:

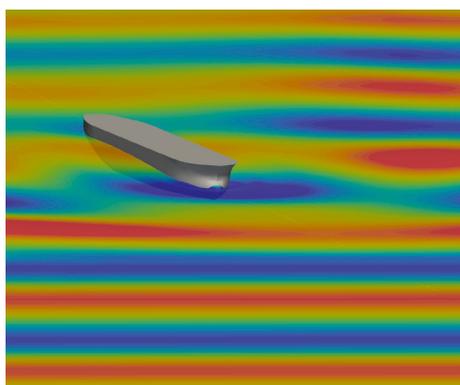
- Industry Sector: **Maritime**
- Country: **United Kingdom**
- Software Used: **HELIX**

ORGANISATIONS INVOLVED

The Numerical Algorithms Group (NAG) is a UK HPC expert and software supplier. ENGYS is a UK ISV specialising in open source CFD solutions including the HELIX software used in this experiment.

CETENA is an Italian company specialising in the maritime field.

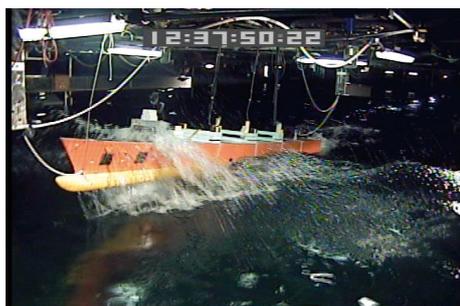
EPCC, the supercomputing centre at the University of Edinburgh, was the HPC provider.



THE CHALLENGE

Developing effective methods and tools to achieve accurate predictions of additional ship resistance in waves (compared to calm seas) is currently a high priority for ship designers, shipbuilders and maritime consultancy companies.

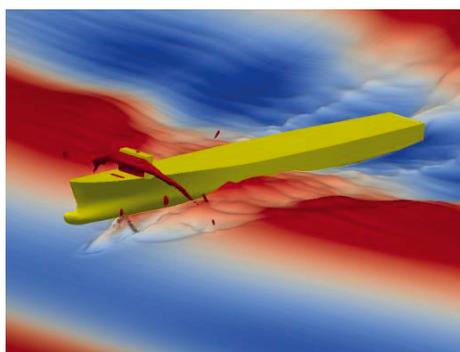
Physical testing is time consuming and expensive. Accurate and reliable numerical methods to complete such assessments need to be developed as a viable alternative to traditional experimental tests. In this respect, the potential savings for a shipbuilding company could amount to more than €100,000 per year by reducing the need for experimental models in favour of an HPC-based simulation analysis.



THE SOLUTION

Performing the simulations in-house with the required degree of accuracy is currently not a viable approach for a small company because it takes too long. A single wave and speed condition simulation typically takes multiple days to complete on a medium size HPC cluster with 80 to 100 cores. Methods that need less computing time exist, but do not produce results of a sufficiently high quality.

The solution is to use a cloud-based HPC approach, in which multiple jobs can be submitted to a large on-demand HPC resource (in this case based at the University of Edinburgh). The HELIX client has been adapted to be able to submit jobs to the HPC service seamlessly. The software that runs on the HPC system has been optimized to run efficiently on multiple cores and return the results quickly to the user.



BUSINESS IMPACT

Potential savings for CETENA (or a similar shipbuilding company) could amount to more than €100,000 per year by employing the new cloud-based HPC numerical solutions developed in this experiment. The pay-per-use business model is highly attractive for SMEs (such as design and engineering consultants), as the purchase and maintenance of an in-house cluster are too expensive.

Fortissimo Experiment Partners:

- **CETENA** (End User)
- **ENGYS** (ISV)
- **Numerical Algorithms Group (NAG)** (HPC Expert)
- **UEDIN** (HPC Provider & Host Centre)

More Information:

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All software additions planned by ENGYS are expected to increase the sales of both HELYX and HELYX-EcoMarine products. By offering a new state-of-the-art CFD software solution for advanced ship resistance calculations, in line with the latest International Maritime Organization guidelines, they will increase their competitiveness in this market.

The target market for exploitation is extensive, with over 830 active shipbuilders and shipyards operating worldwide and a predicted global revenue of €240 billion by 2019, representing a five-year projected 1.2% annualized growth. In Europe alone, there are over 150 large shipyards with a global market share of around 6% in terms of tonnage and 35% for marine equipment, totaling €60 billion in annual turnover according to official EU figures from 2012.

As a first step towards exploiting this large market, the partners are currently targeting a small group of companies in the maritime industry located in Italy, Japan and South Korea to take-up the technology developed in Fortissimo.

BENEFITS

There are multiple benefits for CETENA:

- Lower computational cost and no need for expensive physical model tests.
- Better quality of results due to the use of cloud-based HPC
- Much reduced time in the design cycle due to being able to analyse multiple scenarios in parallel.
- Potential savings that could amount to more than €100,000 per year for a typical user

THE FORTISSIMO PROJECT

Fortissimo is a collaborative project that enables European SMEs to be more competitive globally through the use of simulation services running on a High Performance Computing cloud infrastructure. The project is coordinated by the University of Edinburgh and involves more than 100 partners including Manufacturing Companies, Application Developers, Domain Experts, IT Solution Providers and HPC Cloud Service Providers from 14 countries. These partners are engaged in over 90 experiments (case studies) where business relevant simulations of industrial processes are implemented and evaluated. The project is funded by the European Commission within the 7th Framework Programme and Horizon 2020 and is part of the I4MS Initiative.

 Fortissimo is part of I4MS ICT Innovation for Manufacturing SMEs: www.i4ms.eu



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