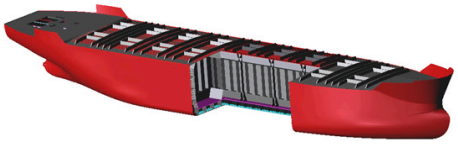
FORTISSIMO

# HPC Cloud-based standard strength assessment of commercial ships

**Fortissimo Experiment Facts:**
- Segment: Maritime
- Application Domain: FEM
- Application: RamSeries

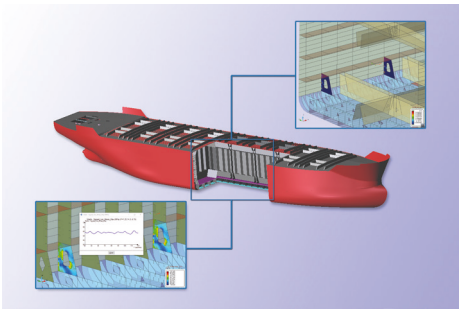
## The Company

The standard strength assessment of merchant ships such as tankers and container ships is an important and statutory requirement. The objective of this experiment was to develop and validate an easy-to-use solution for standard strength assessment calculations using HPC-Cloud-based resources. This solution has been made available to the end-user ISONAVAL, an SME working in the areas of naval architecture and marine engineering services. ISONAVAL is specialized in structural and piping systems design, and the generation of analysis and production information for ships, yachts and naval artefacts. ISONAVAL has recognised expertise in the use of simulation. COMPASSIS is an SME ISV which markets simulation software, RamSeries, in different engineering fields including multiphysics simulations and structural analysis. In this experiment the expertise and software of COMPASSIS will be complemented by FNB-UPC, a University research centre developing innovative simulation tools and implementing them on HPC systems.



## The Challenge

The challenge addressed in this experiment was to demonstrate the use of advanced simulation in standard strength assessments of merchant ships. Such simulations require large amounts of computing power to realise viable calculation times. This requires the use of computing resources from an HPC provider. The objective of this experiment was to adapt standard strength assessment software, RamSeries, to run on remote HPC resources, to demonstrate the benefits of advanced simulation using Cloud-based HPC, to study the resultant performance of the simulations and to demonstrate their potential economic impact. A further aim was to develop a service for standard strength assessment available within the Fortissimo Marketplace. Realising such aims would give ISONAVAL a powerful design tool and a significant competitive advantage.



## The Solution

The relevant software packages, including RamSeries, have been ported to an HPC-Cloud-based system and integrated into an overall simulation package. An effective interface between the end-user and the HPC resources has been implemented which integrates the various software components and the HPC system. This enables the simulations to be run from a familiar desktop system whilst using the full capabilities of the HPC system. The simulations running on the HPC system have been benchmarked using a model of the full 3D hull structure of a merchant ship. These demonstrated a significant speed-up by a factor of 42 through the use of an HPC system. This makes previously infeasible simulations now feasible and paves the way for new services to be offered by the ISV COMPASSIS.

## The Benefits

A standard strength assessment study of a tanker requires more than a week on a desktop system. The use of RamSeries with HPC resources allows a complete analysis in less than 6 hours. This significantly reduced compute time fits much better to the design cycle of companies.

**Fortissimo Experiment Partners:**
- ISONAVAL (End-user)
- COMPASSIS (ISV)
- FNB-UPC (Domain Expert)
- CESGA (HPC Provider)

**More Information:**
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COMPASSIS will increase its market by introducing the use of the RamSeries software for the direct strength assessment of a complete ship structure. This assessment requires large computational and data storage resources. COMPASSIS estimates an additional annual revenue of €24K in 2017 growing to €120K in 2020, due to the sale of direct strength assessment of complete ship structures using RamSeries integrated with a Fortissimo HPC infrastructure.

ISONAVAL estimates an additional annual revenue of €15K in 2017 growing to €60K in 2020, also due to the sale of direct strength assessment of complete ship structures.

CESGA will offer new HPC added-value services for SMEs such as benchmarking to analyse performance of HPC applications, including multi-core scalability and its dependency on different parameters such as size of the problem and processor frequency. It expects a consequent increase in its HPC services and customers. New alliances with ISV and application experts have been formed during this experiment. Revenues based on 3 benchmarking studies and an annual fee for hosting the ISV software and for infrastructure maintenance will be around €35K over a 4-year period.

## 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 123 partners including Manufacturing Companies, Application Developers, Domain Experts, IT Solution Providers and HPC Cloud Service Providers from 14 countries. These partners are engaged in 53 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 is part of the I4MS Initiative.

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

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