



FORTISSIMO

HPC-Cloud-based seakeeping design

ORGANIZATIONS INVOLVED

Seakeeping is the study of a ship or marine structure that is subject to the action of waves. WAVEC is a private non-profit association active in applied research and consulting. VICUSDT operates in the shipbuilding and shipping industries, providing hydrodynamic engineering services. It also provides hydrodynamic analysis capabilities to the offshore and marine energy sector, carrying out advanced simulations of structures for the oil and gas industry. COMPASSIS is an SME ISV which provides simulation software for a variety of different engineering fields including multiphysics simulations and structural and seakeeping analysis. In this experiment COMPASSIS will enable and evaluate simulations that require intense computational and data storage resources.

End User



ISV



Domain Expert

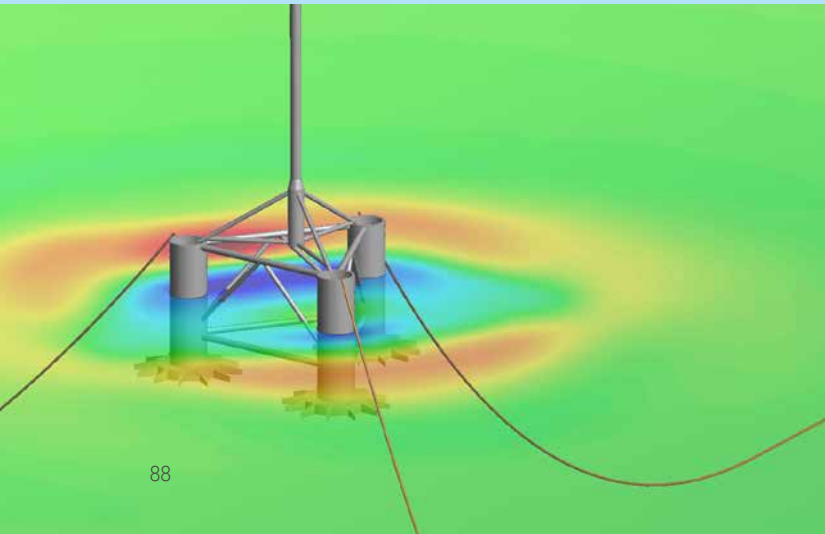
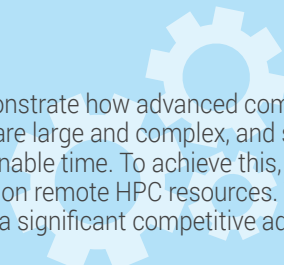


HPC Provider



THE CHALLENGE

The challenge addressed in this experiment was demonstrate how advanced computing can optimise seakeeping design. Seakeeping simulations are large and complex, and so require significant compute power to be completed in a reasonable time. To achieve this, existing seakeeping software would need to be adapted to run on remote HPC resources. This would give WAVEC and VICUSDT a powerful design tool and a significant competitive advantage.



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The use of Cloud-based-HPC simulations enables cases to be analysed far more quickly than was previously possible. Due to the speed up in calculation time, it also allows previously infeasible cases to be analysed, and solutions devised.


THE SOLUTION

The relevant software packages have been ported to the HPC-Cloud-based system and integrated into an overall simulation package. An interface between the end-user and the HPC resources has been implemented, so simulations can be run from a familiar desktop system whilst using the full capabilities of the HPC system. The simulations have been benchmarked using a model of an off-shore floating wind platform and a model of a stern trawler, which showed a speed-up by a factor of 45 on the HPC system.

EXPERIMENT #605 HIGHLIGHTS

Industry Sector:
Maritime

Country: **Portugal and Spain**


Software used:  **Wave and in house code SeaFEM**

End Date:
December 2016

BUSINESS IMPACT

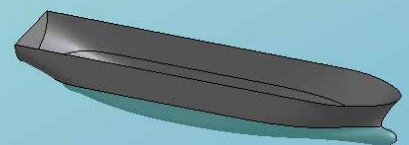
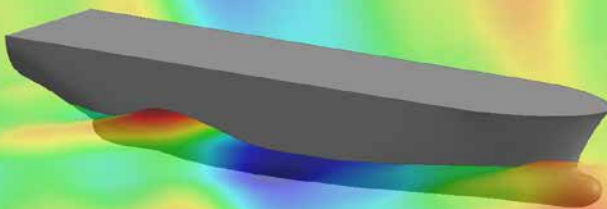
The use of Cloud-based-HPC simulations enables cases to be analysed far more quickly than was previously possible. Due to the speed up in calculation time, it also allows previously infeasible cases to be analysed, and solutions devised. The ability to take on seakeeping cases that other companies cannot gives WAVEC and VICUSDT a significant competitive advantage in the sector.

HPC-Cloud-based simulation of marine structures has the potential to expand WAVEC's activities as a consulting company specialized in services for the offshore renewable industry and other related industries (aquaculture, oil and gas). Over the next four years, from 2017 to 2020, WAVEC expects an increase in its total profit of ~€550K, based on a revenue of €1.8M, due to an increase in its consultancy activities. Over the same four-year period, VICUSDT expects an increase in its total profit of €480K, based on a revenue of €1.4M, due to an increase in its consultancy activities. Over the same four year period, COMPASSIS expects an increase in profit of €2M based on an increase in its licence sales of €4.5M.

A service for seakeeping assessments based on the results of this  experiment is planned to be available in the Fortissimo Marketplace offering a pay-per-use model. Furthermore, CESGA proposes to offer a service in the Marketplace bases on the benchmarking of key applications and their performance and scalability.



Wavec
Portugal
Vicusdt
Spain





FORTISSIMO

HPC-Cloud-based standard strength assessment of commercial ships

ORGANIZATIONS INVOLVED

ISONAVAL, an SME working in the areas of naval architecture and marine engineering services, is specialized in the generation of analysis and production information for ships, yachts and naval artefacts. Merchant ships (such as tankers and container ships) must undergo a standard strength assessment as a statutory requirement, and advanced simulation could be useful in standard strength assessment calculations. 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.

End User



ISONAVAL
www.isonaval.net

ISV



www.compassis.com

Domain Expert



www.upc.edu

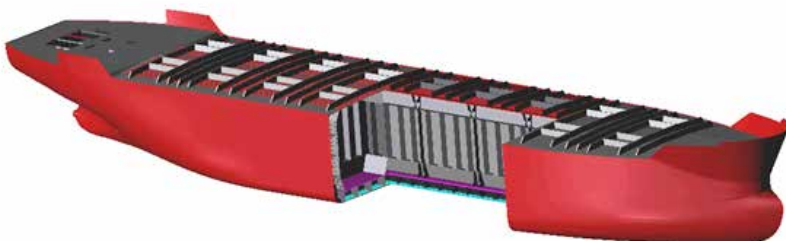
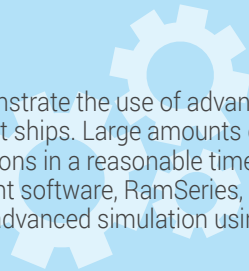
HPC Provider



www.cesga.es

THE CHALLENGE

The challenge addressed in this experiment was to demonstrate the use of advanced simulation in standard strength assessments of merchant ships. Large amounts of computing power are required to complete these simulations in a reasonable time. The objective here was to adapt standard strength assessment software, RamSeries, to run on remote HPC resources, and demonstrate the benefits of advanced simulation using Cloud-based HPC for this purpose.



Large amounts of computing power are required to complete the simulation in standard strength assessments of merchant ships in a reasonable time.

The relevant software packages have been ported to an HPC-Cloud-based system and integrated into an overall simulation package.

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. The simulations 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.

EXPERIMENT #606 HIGHLIGHTS

Industry Sector: **Civil Engineering**

Country: **Spain**

Software: **Compassis**

End Date: **December 2016**

BUSINESS IMPACT

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

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.



Isonaval
Spain

