A Greek HPC Success Story in ‘Industrial Safety Assessment’

SUCCESS STORY IN INDUSTRIAL SAFETY ASSESSMENT (Greece)

COMPANY: Hellenic Petroleum (ELPE)

One of the leading energy groups in South East Europe, with activities spanning across the energy value chain and presence in 6 countries. ELPE has a range of activities that includes: (i) Supply, Refining, and Trading of petroleum products, both in Greece and abroad (ii) Fuels Marketing, both in Greece and abroad (iii) Petrochemicals Production and Trading (iv) Oil & Gas Exploration and Production (v) Power Generation & Natural Gas (vi) Provision of Consulting and Engineering services to hydrocarbon related projects

THE PROBLEM

Safety assessment of potential explosion accidents towards developing guidelines for simple and widely used in industrial sites, aka integral models.

SUCCESS STORY DETAILS
HPC provider: ARIS GRNET
Domain Expert: NCSRD – Environmental REsearch Laboratory (EREL)
Country: Greece
Link: https://bit.ly/3If5H6B

HPC PROBLEM DOMAIN

The HPC problem domain falls within CFD validation methodologies / models against experiments in complex obstructed / confined environment.

Optimize/develop guidelines for integral code input data in the cases of explosion in complex industrial areas based on the CFD methodology.

THE HPC SOLUTION

Solve the problem in many computational resources in parallel, thus eliminating the need for assumptions and approximations

Resources: 200 cores, 500GB RAM

THE BENEFITS

- Detailed representation of whole industrial site
- Less assumptions
- More robust solution
- Guidelines for parametrization of DSS and production models

Design inspiration NCC Austria

SUCCESS STORY IN INDUSTRIAL SAFETY ASSESSMENT (Greece)

THE PROBLEM

Safety assessment of potential explosion accidents is conducted in industrial areas where flammable gases and vapors are processed to predict the resulting explosion overpressures. This assessment is usually carried out using simple integral codes, such as Phast. These codes require crucial input parameters which may have great impact on the overpressure predictions especially in case of complex geometry. The purpose of the project is to improve the predictive capabilities of these models in explosion scenarios in complex industrial areas using the more advanced and accurate Computational Fluid Dynamics (CFD) methodology.

THE HPC PROBLEM

A detailed digital representation of the industrial infrastructure needed to be considered, thus, a very high-resolution grid was necessary, leading to high requirements in memory, number of cores and network bandwidth. At the same time, the problem itself, explosions and fire dispersion, demands complex methodologies and approximations that augment the problem of computer resources.

THE SOLUTION

Solve the problem in many computational resources in parallel using ANDREA-HF CFD code that is parallelized with FORTRAN & MPI programming language.
The infrastructure used was ARIS GRNET (20 THIN nodes, 200 cores, 500GB RAM, InfiniBand FDR 56Gb/s network).

THE BENEFITS

The main benefits of the project are:

- To further develop and validate existing CFD methodologies/models against experiments in complex obstructed/confined environment.
- To optimize/develop guidelines for integral code input data in the cases of explosion in complex industrial areas based on the CFD methodology.

In essence the use of large HPC infrastructure enables :

- Detailed representation of industrial area with complex geometry
- Taking less assumptions
- More robust solutions by performing many explosion scenarios

EURO