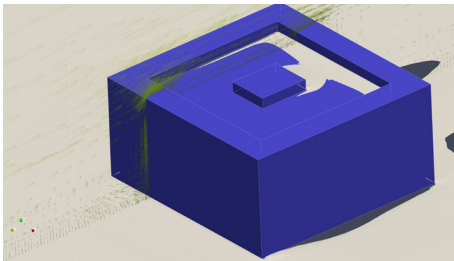


## HPC-Cloud-based simulation of drifting snow

### Fortissimo Experiment Facts:

- Segment: Building Industry
- Application Domain: CFD
- Application: OpenFOAM



### The Company

Founded in 2005, Binkz is an SME whose business is consultancy, specialising in single and multiphase flows. Binkz provides state-of-the-art consultancy services using computational fluid dynamics (CFD) for applications such as wind engineering, process technology and aircraft icing.

Every year, roof collapses due to accumulated and drifting snow are responsible for losses of hundreds of millions of Euros as well as bodily injuries and loss of life. This is a problem for all countries in Northern Europe and more generally in the Northern hemisphere. The maximum snow load that may be accumulated on a building rooftop is an essential parameter in assessing the safety and stability of a building. It is, however, hard to predict the maximum snow load when designing a new building. This leads to a costly over-design of the structure, which could be avoided if the snow load could be predicted with sufficient accuracy.

Binkz has developed the CFD program snowFoam. This program allows an accurate assessment of snow loads on buildings. When compared to existing alternatives, snowFoam is more accurate, more reliable and more versatile, but it requires the computational resources that only an HPC system can provide.

### The Challenge

The overall challenge was to study the commercial feasibility of a CFD consultation service to civil engineering firms for assessing snow loads on buildings employing snowFoam on the Fortissimo HPC-cloud infrastructure. For the viability of such a consultancy service, it is essential that both the simulation time and the cost of the computation are acceptable within the framework of a typical CFD consultation project.

### The Solution

The work in this case study has shown that the simulation of drifting snow using snowFoam is feasible using a Cloud-based HPC system. An analysis can be completed within a few weeks, which fits well with the timescales for the design of buildings. In the solution developed in this case study, the user has access to computing resources, storage and visualization facilities from a desktop environment via a secured webpage in a browser. The required computational resources needed and their costs are appropriate considering those for the overall design of a building.

### Fortissimo Experiment Partners:

- Binkz (End-user and Code Developer)
- Vortech (HPC Expert)
- SURFsara (HPC Provider)

### More Information:

[www.fortissimo-project.eu](http://www.fortissimo-project.eu)

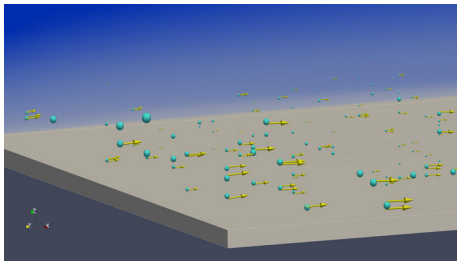
E-Mail: [info@fortissimo-project.eu](mailto:info@fortissimo-project.eu)

## The Benefits

The simulation of drifting snow requires significant compute resources, which can only be provided by a large HPC system. A typical simulation of drifting snow takes 50,000 CPU hours. This equates to 150 CPUs for 14 days. Furthermore, at a cost of €0.2 per CPU hour, this represents a cost of €10,000. A small consultancy at Binkz would not be able to afford the capital cost of a system containing 150 CPUs, neither could it use a smaller system in-house because the computation time would be much longer than the target two weeks. Even if Binkz were to buy a suitable system, then it would only be used for a fraction of the time and its overall costs would be much greater than the use of a Cloud-based system. Consequently, there is a clear benefit for Binkz in the use of a Cloud-based HPC system.

## 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](http://www.i4ms.eu)



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