

## HemoSphere – Prototyping of Blood-Processing Microfluidics in the HPC cloud

### Fortissimo Experiment Facts:

- Industry Sector: **Microfluidics**
- Country: **France**
- Software Used: **HemoSphere**

### ORGANISATIONS INVOLVED

AENITIS TECHNOLOGIES S.A.S. (End User) is a French microfluidic company that is developing a blood sorting device.

ELECTRIC ANT LAB B.V. (ISV) is a Dutch software company that specialises in complex fluid simulations.

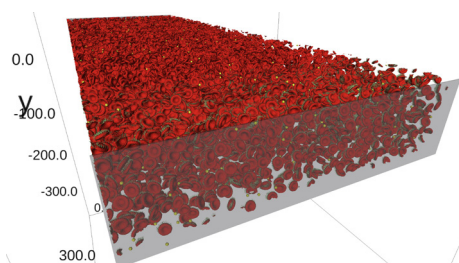
SURFSARA (HPC Provider) is the operating company for the Dutch national super computer, HPC centre Cartesius.



### THE CHALLENGE

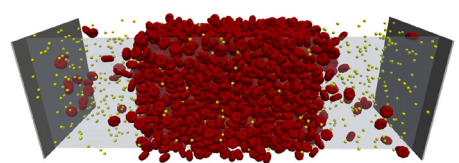
Electric Ant Lab (EAL) has developed HemoSphere for the detailed simulation of complex fluids. This technology can be applied to prototyping microfluidic chips. The microfluidics industry is a young medical technology and equipment field where small-scale phenomena are difficult to observe. In this field there is a large demand for more cost-effective and methods as opposed to trial-and-error process for prototyping new chips.

The challenge facing this experiment was to replicate the behaviour and small-scale phenomena of an acoustophoresis chip into a browser-based simulation tool.



### THE SOLUTION

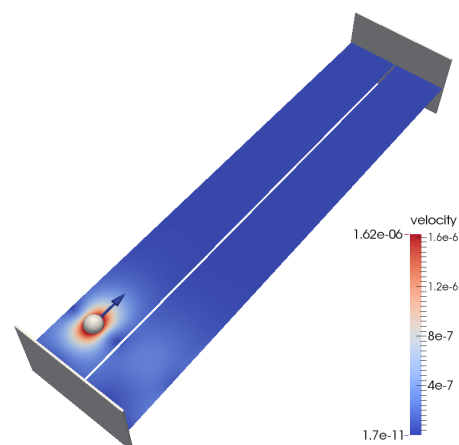
A simulation model of the microfluid device of Aenitis was developed which is much truer to reality than previously used models. This was achieved by explicitly incorporating the generation of a soundwave in the system. Rather than assuming that the soundwave induces certain forces, the model allows the acoustic forces to develop naturally from the interaction of the soundwave with the particles (blood cells) present in the microfluidic channel. In this way, more insight and understanding of the processes in the microfluidics device could be generated.



### BUSINESS IMPACT

The use of simulations in the development of acoustophoretic microfluid devices as developed at Aenitis can significantly reduce development costs. In the laboratory, a single microfluidics geometry needs to undergo a large series of tests to assess its performance. With the same approach in HemoSphere, these development iterations can be run faster. More information about the fluid behaviour will also be generated, as these phenomena are not easy to research visually. In the laboratory only one experiment iteration at the same time can be achieved. In HemoSphere multiple experiments can be executed at the same time.

For microfluidic companies this approach can create a tremendous impact on the time spent in the development and prototyping stage of the microfluidic chip design process. It also requires less resources in terms of produced physical prototypes and the usage of human blood samples.



### Fortissimo Experiment Partners:

- Aenitis Technologies (End User)
- Electric Ant Lab (ISV)
- SurfSARA (HPC Provider)

### More Information:

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

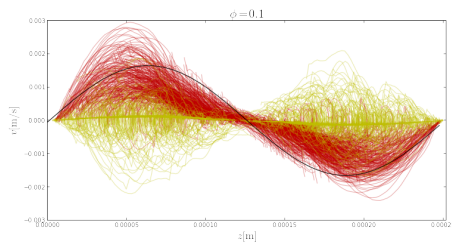
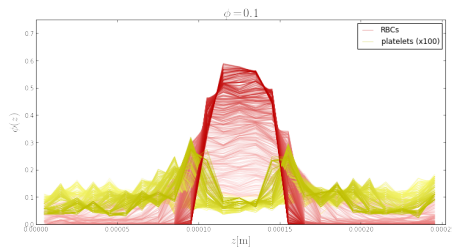


## BENEFITS

- Savings between 20k EUR and 25kEUR for a single prototype.
- Time saving: experiments in the physical lab can take about 4-6 months, where the virtual experiments can be performed in a matter of days or weeks.

## 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.



**I4MS** Fortissimo is part of I4MS ICT Innovation for Manufacturing SMEs: [www.i4ms.eu](http://www.i4ms.eu)



This project has received funding from the European Union Seventh Framework Programme under grant agreement No 609029 and from the European Union's Horizon 2020 research and innovation programme under grant agreement No 680481.