As Grid problem solving flows smoothly

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By developing the architecture to run Computational Fluid Dynamics (CFD) applications on the Grid, the IST programme-funded initiative has provided industrial and academic users with the ability to solve complex problems without the need to invest in the costly parallel computing infrastructure that would otherwise be necessary.

"There is a vast market of users out there who only need to use CFD applications occasionally and it makes no sense for them to acquire high performance processing systems," explains project manager Norberto Fueyo at the University of Zaragoza in Spain.

Such users could be architects looking to calculate the wind flow around a building, a train manufacturer trying to determine the aerodynamics of a new design or even a medical researcher attempting to simulate blood pressure in an artery.

"With Grid computing they can acquire the processing power they need when they need it and only for how long they need it to run their calculations," Fueyo says.

The FlowGrid architecture provides them with that ability through Grid middleware that allows users to find available clusters of processors, run their calculations and obtain results in potentially less time than with parallel systems. Because CFD problems are typically broken down into a mesh of cells to model fluid dynamics, the added resources of the Grid also permit greater precision in the calculations.

"More cells require more resources but also result in more precise output," Fueyo notes. "The scalability of the Grid allows a user to run calculations on one million cells or tens of millions of cells - much more than most parallel computing systems can handle."

It is also considerably cheaper. A cost analysis carried out by the project concluded that it would cost a typical industrial user as little as 10 to 20 euros to solve a standard CFD problem over the Grid, compared to the thousands it costs to buy high performance processors.

The architecture was evaluated in four test cases run by the consortium's four industrial users who employed it to simulate train aerodynamics, ship hydrodynamics, diesel exhaust and gas combustion. Many of the partners are continuing to use the architecture, Fueyo notes, and one of them, British company Symban, is currently in the process of commercialising it.

Source: IST Results