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SURFnet Best Practices

## DEISA: Distributed European Infrastructure for Supercomputing Applications **Best Practice**

Thanks to the DEISA infrastructure academics can optimally distribute their extremely intensive computations across the European supercomputers.

'There are many advantages in distributing the demanding computations of academics across the available supercomputers on a European scale,' says Axel Berg, Business Unit Manager High Performance Computing and Visualisation of SARA Computing and Networking Services. 'One system is largely dedicated to a very intensive computational task, and the other jobs are distributed across the remaining computers that are part of the collaboration. It is also possible to assign the most suited supercomputer to a specific type of calculation, or to distribute the work across multiple systems. This European collaboration allows us to meet extreme research demands and to confront the real challenges in science.'

### **Eleven-cities Tour**

Examples of academic areas that require large amounts of computing power are theoretical chemistry, nanotechnology and astrophysics. Climate research is another typical application for a supercomputer. For instance, the group headed by prof. dr. Henk Dijkstra of the Netherlands Centre for Climate Research (CKO) has used an extensive model to simulate the climate. Using this model many simulations were performed that were compared to observations over the past sixty years. 'We subsequently generated simulations in order to be able to predict the climate for the next eighty years,' Axel Berg explains. 'These predictions vary from global warming

to more local issues, such as: what is the probability of extreme weather events in the Netherlands as a result of climate change? Does the probability of an Elfstedentocht (Dutch skating eleven-cities Tour) increase or decrease?' The calculations, which were performed over several months on a supercomputer at the High Performance Computing Center HLRS in Stuttgart, show what is going to happen with variables such as temperature, relative humidity and air speed in various places on earth. 'These were extremely intensive calculations which generated over fifty terabytes of data. In this case the German system was the best choice for the simulations. Some systems are just better suited to specific applications than others.

### Share fairly

DEISA - Distributed European Infrastructure for Supercomputing Applications - is a collaboration between eleven partners in seven countries (Germany, England, Finland, France, Italy, Netherlands and Spain). This European project was launched in 2004 and will continue into 2008. Academics can submit proposals annually, which are first assessed on the national scale. They are subsequently discussed when the European partners meet. Axel Berg is SARA's representative. 'Each partner makes a certain capacity available for DEISA jobs on its own supercomputer, and then it is a matter of distributing and planning. The Netherlands has ten percent of its national supercomputer capacity reserved for DEISA. At the European level we distribute the applications over the available capacity in such a way that is budget neutral for all countries.'

### No small matter

However, there is a lot to be done before the selected projects can start their computations. 'These are the most massive jobs imaginable. It is no small matter to just go and start them on a different computer,' Axel

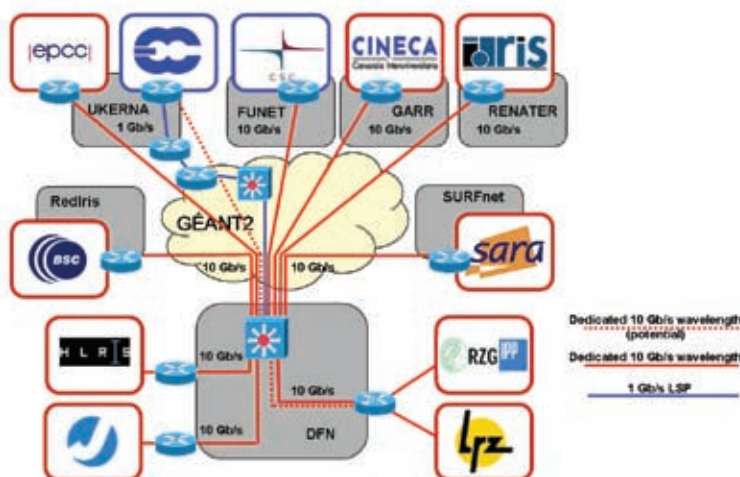
Berg explains. 'From DEISA we offer the users support in running their application at another location. The global file system is an essential part of the DEISA-infrastructure. All data which are stored using that system can be accessed from another computer as if they were locally available. The access is transparent for the users and the applications, and there is no need to copy data to the supercomputer where the computations take place.' To make things run smoothly from a technological and administrative point of view, a team is formed for each project that makes use of the DEISA infrastructure. This team consists of researchers, staff members at their own computing centre and staff members for the computer where the application will run.

### Network

This exchange of computer capacity and the access of data in other locations would be impossible without the superfast network that interconnects the European supercomputers. 'Retrieving the data from another location requires a lot of bandwidth. DEISA therefore has a dedicated 10 Gigabit/s network on GÉANT, the European research network. The global file system can fully make use this bandwidth,' says Axel Berg. 'The Dutch supercomputer at the SARA location is directly connected to SURFnet. In this way our academic users have fast access from all over the country. SURFnet provides a 10 Gb/s lightpath from our supercomputer to GÉANT. Using a GÉANT lightpath we are then connected to a central DEISA router in Frankfurt. Clearly we could not be part of DEISA if it weren't for SURFnet.'

Further information:

[www.deisa.org](http://www.deisa.org)



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