

## Research Department PROFITING FROM HIGH-PERFORMANCE COMPUTING

Numerical simulation can be a tool for SMEs to achieve competitive advantage. Although the transition is not easy, a network of experts is at hand to help them.

BY THIERRY LUCAS

**N**umerical simulation is not for us!» For many small and medium-sized enterprises, high-performance computing is synonymous with overcomplicated software and exorbitantly priced supercomputers that only the major groups can master and afford to purchase. Nevertheless, simulation helps speed up and improve product design, and can be a tool to achieve competitive advantage. For SMEs, however, this is a demanding, strategic commitment. The HPC-SME initiative run by the French National High-Performance Computing Organization (GENCI) and the French Institute for Research in Computer Science and Automation (INRIA), with financing by the French public investment bank Bpifrance, aims to give SME's easier access to high-performance computing (HPC).

### 1 DEFINING YOUR PROJECT AND IDENTIFYING THE ISSUES

In this little-known field, SMEs need help identifying their numerical simulation needs, as well as the financial, technical and human resources they can invest in it. This is the main role of the HPC-SME initiative. «There is a wide range of

#### THE HPC-SME PROGRAM

Le Genci, INRIA and Bpifrance (ex-Oséo), together with the Aerospace Valley, Axelera, Systematic, Minalogic and Cap Digital business clusters, have launched the HPC-SME Initiative. Their aim, to give SMEs greater access to high-performance computing via innovative projects generating business competitiveness. Access available throughout their research

work. The challenge is to engage SMEs in broaching the issue of high-performance computing. This will be achieved by helping them evaluate its relevance from the perspective of their growth model. The program also aims to enlist support for SMEs from high-performance computing professionals, and help them put together their R&D programs.

profiles, from business start-ups to companies already using HPC on a workstation. Our role is also to direct them to the right people,» says Brigitte Duême, in charge of HPC-SME at INRIA. The hpc-connexion.org website should make it easier to put businesses in touch with experts and researchers. Even 'initiated' users need to determine their project's issues.

For the Franco-Belgian engineering company GDTEch, which employs 130 people, including around thirty in France, simulation is already part of the company's business. But this SME wants to draw up a HPC offer that is independent of its clients' computers (clients predominantly in aeronautics), using national and regional computing centers and its own resources. The strategic issue being diversifying its business beyond aeronautics. HydrOcean, an SME that is itself a fluid mechanics software vendor, wants to adapt its computational code to parallel computers based on graphics processing units (GPUs). «The idea is to divide computing time by five or ten and thereby convince new clients beyond our original maritime sector,» says Erwan Jacquin, HydrOcean's president. Using HPC may also be linked to setting up a business, as in the case of Q-Hedge Technologies. The company developed a financial consultancy website aimed to make decision-making tools hitherto reserved for experts available to the general public.

### 2 FINDING SKILLS

Defining a project may result in employing an expert. Generally speaking, the transition to HPC leads to hiring someone. Danielson Engineering, began using simulation several years ago to design car engines, hired a computer scientist. This was to create skills interfaces easily accessible to the company's engineers. Parallelization of HydrOcean's software also required hiring a new expert, even though the company employs 20 engineers. Some companies also use the HPC-SME network. For example, Entares (Nexio Group), an electromagnetism simulation (antennas, radar signatures, etc.) software vendor. «HPC-SME has opened up doors to us at IBM and Fujitsu for carrying out tests on machines. This would otherwise be impossible for an SME,» emphasizes Frédéric Amoros-Routié, Nexio's president. It is good to acquire skills, but even better to keep them. «Unlike a major group, we can't afford to lose an expert or two,» says Rui Da Silva, head of computational design at Danielson Engineering. So what should SMEs do? Avoid concentrating expertise in a given field in a single person and most importantly, entrust experts with real responsibilities so that they will want to stay.

### 3 CHOOSING HARDWARE AND SOFTWARE

Should you purchase a 'heavy duty' computer or rent power? There are many possible solutions, depending on the needs and financial resources of each SME. «Be careful though, using external equipment may be problematic for confidential contracts. And bandwidth for some remote computing may be expensive,» points out Rui Da Silva. But the key issue is software costs. «The price of large software packages, with a license fee dependent on how many computing cores are used, is completely unsuitable for an SME



As in the case of Danielson Engineering, the shift to HPC can be a marketing asset.

with two computing projects a year,» laments INRIA's Brigitte Duême. The solution is cloud computing software, charged on a pay-as-you-go basis. Entares is among the small software vendors who have started this. An offer developed with the Midi-Pyrénées Computing Center (CALMIP) is due to begin in 2014. But regular users such as GDTEch must make do with licenses for large software packages, which are essential to work with major contractors. This Franco-Belgian company also uses open-source software, although only for R&D, and is co-developing certain specialized codes.

### 4 MAKING HPC INTO A STRATEGIC TOOL

Moving into numerical simulation costs time and money: there is no point in starting it for a one-off project.

Nevertheless, HPC can become a real strategic tool. The diversified HPC offer set up by GDTEch should help land more comprehensive engineering contracts, by transferring computing hitherto done by its clients. Danielson Engineering regards its simulation skills as a commercial argument and a development tool. «Our offer is enriched by every new task a client entrusts us with. This opens the door to other clients for us. That's the ideal scenario,» says Rui Da Silva. Success with this is quite rare among French SMEs. The second phase of the HPC-SME initiative, launched in 2013, aims to use major contractors to stimulate interest in high-performance computing among sub-contractors. In particular, this will be achieved via business clusters and other collaborative organizations. There is also a plan to set up 12 regional centers, to listen to what SMEs need. ■