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Technology

Europe exceeds U.S. in refining grid computing

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When the Swiss-based pharmaceutical giant Novartis needed a new supercomputer for designing drugs, the company found that it already had one. It was hidden in the unused computing power the company had available in the thousands of PCs that were already being used in its offices.

Novartis used American software technology to harness the power of its office personal computers, but European and American scientists and government officials said Europe is moving faster than the United States to capitalize on the approach, grid computing.

Grids lash individual computers together, tapping their unused power to tackle complex computing chores beyond the scope of isolated processors. They are being called upon by scientists and corporations for a variety of applications, including building low-cost supercomputers and creating work groups that can span cities or even the globe.

The shift underscores more than a new style of computing. It also signals a new reality in the transfer of computer technologies. The global Internet is accelerating the rate at which new technologies can be deployed anywhere, frequently shortening or even erasing the certainty of American technological leadership.

"Europe has decided that this is a real competitive advantage," said Peter A. Freeman, assistant director of the National Science Foundation for computer and information science and engineering. "And they are going after it."

Novartis used software of the United Devices of Austin, Texas, to link 2,700 desktop personal computers to help create drugs. This summer, the company said it had discovered several promising new chemical molecules with its grid and that it plans to expand the system to its entire corporate network of 70,000 PCs.

Europe's rush to grids underscores cultural and political differences between it and the United States, technologists in each area say. While American universities and companies often lead the innovation parade, the United States sometimes becomes hamstrung in putting new technologies into use by a proliferation of competing computing and telecommunications standards and by government reluctance to orchestrate industrial policies.

By contrast, European governments have traditionally been more effective in deploying unified standards and concentrating on technologies that appear to offer an economic advantage. But that extra help can lead to big mistakes, occasionally pushing technologies so far ahead of the market that they never deliver a reasonable payoff.

Cell phone networks are an example of the difference. Although the technology was invented in the United States, the current European digital cellular networks are generally acknowledged to offer superior service. But Europe's telecom companies have wasted tens of billions of dollars buying the rights to deliver third-generation, or 3G, cell phone services that have generated little interest. With grid computing, Europe may have as much as an 18-month lead in deploying the advances in practical ways, European scientists and government officials said.

While the United States is beginning to respond to a report in February from the National Science Foundation Advisory Panel on Cyberinfrastructure urging coordinated investment in grid technologies, the European Union is preparing to start two major initiatives in early 2004.

One, called Enabling Grids for E-science in Europe, aims to build the largest international grid infrastructure to date, operating in more than 70 institutions throughout Europe, providing 24-hour grid service and a computing capacity comparable to 20,000 of today's most powerful PCs.

The other is a distributed supercomputing project, led by France's National Center for Scientific Research, that will connect seven supercomputers in Europe at optical network speeds, getting a leg up on the TeraGrid project in the United States, which aims to connect the nation's major supercomputer sites.

"The goal is to establish Europe as one of the most dynamic and creative environments in the world to deploy grid-enabled infrastructures," said Mario Campolargo, director for the research infrastructure unit at the European Commission in Brussels.

The strategy appears to be leading toward accelerating the deployment of commercial projects like the Novartis grid.

There are a "number of research-oriented organizations in Europe that have made significant early progress," said Andy Butler, a vice president for enterprise systems in the London office of the Gartner Group, a technology research firm. Europe's advances, he added, mean that "vendors like IBM, Sun and Hewlett-Packard have made a lot of their early progress in Europe, as opposed to the U.S."

The Europeans also have the advantage of a clearer road map than has in the United States, where planning for computing and networking infrastructure is scattered throughout the federal government.

"The European Union has a 5- to 10-year strategic plan finalized," said Larry Smarr, a grid computing pioneer who runs an institute that's associated with the San Diego and Irvine campuses of the University of California. "This is a slap in the face and a wake-up call that things have gone global."

Hewlett-Packard, for example, said last week that it has joined BAE Systems, a British maker of aerospace and defense systems; Cardiff University; the University of Wales, Swansea; and the Institute of High Performance Computing in Singapore to use grid computing for advanced, collaborative simulation and visualization in aerospace and defense design.

The project is being paid for in part by Britain's Department of Trade and Industry and will try to solve computer security problems when using a grid, because businesses like BAE need to control what information should be protected from outsiders.

When it comes to grid projects "geared towards getting real applications running, there are probably more in Europe," said Martin Walker, an executive at Hewlett-Packard who's involved in technical computing for Europe, the Middle East and Africa.

The British government is helping to lead that drive: It is supporting a variety of projects, including the Diagnostic Mammography National Database project, which received matching funds from IBM and aims to use grid computing to create a new model for scanning, storing and analyzing mammograms.

"The nice thing about" the project "is that it is linked to the government's e-science program, not just a random collection of work," said Brian Carpenter, an engineer in the storage and networking section of the IBM Systems Group. The link with the government means that "there is a very good chance that it will be integrated into the national health care system," he said.

The British government alone will spend $335 million on grid computing from 2000 to 2005, said John M. Taylor, director general of research councils in the Britain's Office of Science and Technology and a former director of Hewlett-Packard Laboratories Bristol, the European arm of the company's long-range research laboratories.

"The technology is mostly still coming from the U.S.," said Ian Foster, associate division director for the distributed systems lab at Argonne National Laboratory in Argonne, Ill. "What is happening now--which is either good or worrisome, depending on your perspective - is that there is a tremendous amount of investment in the European Union."

Beyond money from individual governments, the European Union is expected to spend $428 million from 2002 through 2006 to upgrade the grid's infrastructure. Unlike in the United States, all the projects have fixed objectives and private sector partners.

Grid backers argue that lagging American planning and financial support is an issue in part because of evidence that the creation of computing grids will have a direct economic impact. Last month, a study released by the Rural Internet Access Authority, a North Carolina economic development group with industry backing, estimated that deployment of an advanced computing grid in the state would add more than $10 billion and 24,000 jobs through 2010.

The United States is ahead on one front: It has made the most progress in the deployment of computing grids for scientific applications like studying earthquake risks. Next year, the TeraGrid project is expected to offer computing speeds of up to 20 trillion mathematical operations a second and the ability to store a petabyte of information--about what could be saved on 25,000 standard PC hard drives.

Europe's equivalent effort, Openlab, involving IBM and a research center in Switzerland for the Geneva-based European Organization for Nuclear Research, known by its French acronym, CERN, is not expected to reach the same level until 2005.

But the Europeans are racing ahead in developing faster optical networks. A CERN-California Institute of Technology team set an Internet 2 Land Speed Record recently by transferring 1.1 trillion bytes of data in less than 30 minutes.

Such transfer speeds were "not even thinkable a year ago," said Flavia Donno, the computer scientist in charge of physics experiments on the grid for CERN.

Now, the Europeans are ready to move to 40 gigabits a second, relying in part on what is known as dark fiber, unused high-speed fiber optic infrastructure. The test beds will allow scientists and businesses to share information and computer infrastructure in real time.

The work in Europe is much more concentrated on building something ready for end-users than are the grid projects in the United States, said Donno, who worked with American scientists to build the first interoperable grid between Europe and the United States. With Europe ahead in getting large applications running, American scientists have asked for a role in the Enabling Grids for E-science in Europe project. But because European research and development programs do not normally provide financial support for American participation, the Europeans are asking the National Science Foundation to contribute to the project. Freeman, the foundation official, met recently with European Commission officials on the issue.

"I hope they will find an agreement that is a good balance between national competitiveness and international cooperation," said Fabrizio Gagliardi, project leader of the European DataGrid middleware project. There is "so much to be gained if we join forces," he said. "We need a worldwide infrastructure so that we can really work to solve basic problems like the energy crisis and sustainable development."