

## **PRAGMA Pledges Stepped-Up Emphasis on Grid Infrastructure and Culture of Collaboration Among Pacific Rim Scientists**

*NSF Renews UC San Diego-based Pacific Rim Grid Initiative*

October 11, 2006

Doug Ramsey

Attendees at the PRAGMA 10 conference in Townsville, Australia last March; PRAGMA 11 opens in Osaka, Japan on October 15

The National Science Foundation (NSF) has renewed its support for a grassroots effort by U.S. and Pacific Rim engineers who develop cyber infrastructure and software tools in tandem with application scientists who use those grids to advance 'collaborative science' research projects.

NSF will provide \$3.2 million over five years to the Pacific Rim Application and Grid Middleware Assembly (PRAGMA), a four-year-old initiative based at the University of California, San Diego (UCSD). The funding will allow PRAGMA to broaden its impact and accelerate the use and interconnection of grids being deployed around the region.

"We are building an international community of developers and users of advanced grid technologies," said Peter Arzberger, PRAGMA principal investigator and director of Life Science Initiatives at UCSD. "This five-year renewal sends a clear signal that the U.S. recognizes the importance of international cooperation in grid technologies to benefit collaborative team science."

PRAGMA began as a pilot project in 2002 and was renewed for three years in 2003. The initiative originated in the UCSD-based San Diego Supercomputer Center (SDSC), and is now a collaborative project between SDSC, the Center for Research in Biological Systems (CRBS), and the California Institute for Telecommunications and Information Technology (Calit2), where Arzberger, several PRAGMA personnel and collaborators reside on the UCSD campus.

More than 100 individual scientists and engineers from 28 institutions in more than 10 countries are currently collaborating through PRAGMA working groups and infrastructure testbeds. Japan's National Institute of Advanced Industrial Science and Technology (AIST), for example, opened an office in Calit2. "Our office at Calit2 is only possible because PRAGMA exists," said Satoshi Sekiguchi, director of AIST's Grid Technology Research Center. "This persistent presence has enabled a very large number of unique and ongoing technical interactions between Japanese and U.S. scientists and engineers."

"The organization functions as a conduit of technology, people and ideas that are speeding global development of grids and making them more accessible to U.S. scientists," said SDSC's Phil Papadopoulos, a co-PI on the project. "PRAGMA is creating an interlocking fabric for effective international collaboration to support IT-intensive science, and it ensures that the U.S. will continue to play a critical role in this critical arena."

The renewal was announced on the eve of PRAGMA 11, the eleventh semi-annual meeting of the group. It takes place October 15-18 in Osaka, Japan, under the theme, "Investment for the Future of PRAGMA."

"We are delighted to learn that NSF will continue to show strong support for PRAGMA and its efforts to build closer ties among grid developers and users," said PRAGMA 11 organizer Shinji Shimojo, director of the Cybermedia Center at Osaka University. "The time has come to feed back research results accumulated in the framework of PRAGMA, and strive to nurture future human resources in the community as part of PRAGMA's future expansion."

One way to nurture those resources is through educational efforts, including two programs that have already been motivated by, and integrated into, PRAGMA. With funding from a Japanese government agency, Osaka University created the Pacific Rim International Universities (PRIUS) project to send graduate students to work in other countries' PRAGMA labs. The Japanese program, in turn, was based on Pacific Rim Experiences for Undergraduates (PRIME), a three-year-old UCSD program that has sent roughly two dozen undergraduates to conduct research in Japan, Taiwan, China and Australia.

The PRIUS program will hold a special workshop in Osaka immediately following PRAGMA 11. Noted Shimojo: "Programs such as PRIUS and PRIME are changing the graduate and undergraduate academic experience by promoting international engagement and cooperation as an everyday part of doing scientific research in the 21st century. Furthermore, their enthusiasm and curiosity stimulates our researchers and their collaborative science."

Most grids for scientific research are national in nature (e.g., TeraGrid in the U.S.), and their software applications and middleware are tailored to run on the specific country's infrastructure. "We are trying to interconnect those national grids and make the infrastructure usable on a routine basis," explained UCSD's Arzberger, who also chairs the PRAGMA steering committee.

With NSF's renewed support, PRAGMA researchers plan to expand the group's activities on several fronts. They hope to build user communities in two new key application areas: geosciences, through iGEON, the new international counterpart of the NSF-funded, SDSC-based Geosciences Network (GEON); and microbial metagenomics-decoding the genomes of entire microbial ecosystems. The latter effort will complement work done in CAMERA- Community Cyberinfrastructure for Advanced Marine Microbial Ecology Research and Analysis-a seven-year, Calit2-based project funded by the Gordon and Betty Moore Foundation last January.

"We will also continue to expand our testbed to new sites and establish a dedicated data infrastructure-both data handling and data sharing," explained PRAGMA co-PI Mason Katz, group leader for cluster development at SDSC, and co-lead of the PRAGMA Resources working group. "Two key measures of our ultimate success will be the science that is enabled on a routine basis, and the new communities that embrace the tools and approach of collaborative science via cyberinfrastructure. Such successes will validate the global investment in tools and PRAGMA's model."

In seeking renewed funding, PRAGMA leaders pointed to the organization's track record over the past three years: 36 major publications; development of a far-flung laboratory spanning 19 sites and 13 countries to test grid technologies; six major middleware codes developed by PRAGMA members and migration of key software developments via the partnership across the Pacific in both directions-e.g., Japan's Nin-G middleware to U.S. users, and Rocks cluster software developed at SDSC into a Korean-language version called KRocks. Further, PRAGMA's conduit of information and software exchange has benefited application user groups such as those associated with the NIH-funded National Biomedical Computation Resource, by introducing and disseminating software to the worldwide biomedical community.

"There have also been unexpected benefits," added SDSC's Papadopoulos. "The community became a forum for U.S. scientists to provide help to Taiwanese researchers in their fight against SARS, and a new international activity called GLEON-the Global Lake Ecological Observatory-grew out of PRAGMA collaboration in Taiwan's EcoGrid project."

EcoGrid is one of four "driving" applications in PRAGMA that span multiple sites and research areas. Other applications focus on protein annotation, computational chemistry, and Telescience, a software infrastructure

to support over-the-grid use of remote instruments. Some of the results of this PRAGMA collaboration between Osaka University's Research Center for Ultrahigh Voltage Electron Microscopy and the UCSD-based National Center for Microscopy and Imaging Research (NCMIR) were highlighted recently by NCMIR director Mark Ellisman in a briefing for Emperor Akihito.

According to UCSD's Arzberger, the new funding will also allow PRAGMA to extend its geographic reach into countries that are only now deploying advanced networks or doing grid research, notably New Zealand and Vietnam, as well as Latin American countries such as Mexico, Chile and Costa Rica. PRAGMA leaders also hope to go beyond the strict confines of the Asia-Pacific region, particularly to exchange know-how with scientists in the United Kingdom, Netherlands, Switzerland and other European countries now investing heavily in grids.

The lead NSF division on PRAGMA's renewal is its Office of Cyberinfrastructure, but several other units are also involved, including the Office of International Science and Engineering (OISE), Directorate for Biological Sciences, Division of Biological Infrastructure, and the Division of Information & Intelligent Systems (part of the Directorate of Computer & Information Science & Engineering).

Media Contacts:

Doug Ramsey, (858) 822-5825 Paul Mueller, (858) 534-8564

