

Faculty-led Program Grant Application

Provost International Grants

Applications are due by Friday, February 5, 2010.

Applications should be signed by your Home Department Chair and submitted to:

Office of the Provost
Attn: Provost International Grant Application
Office of Global Affairs
BOX 351237
340 Gerberding Hall

1. APPLICATN INFORMATION

Name of Grant Applicant: Munehiro Fukuda

Position Title/Appointment: Associate Professor

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Home Department Chair: Michael Stiber

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Campus Mailing Address: Box 358334, 18115 Campus Way NE, Bothell, WA 98011-8246

2. GRANT REQUEST INFORMATION

Name of Program: UWB-Shizuoka University Sensor-Grid Integration Project

Term: 1 year Year: 2010 – 2011 Location: Bothell Campus

Amount of grant requested: \$5000

3. PROGRAM INFORMATION

Please provide us with more information about this Faculty-led Program by answering all of the questions below. This is an opportunity for you to describe the impetus for the program in your own words and any unique aspects that will help us better understand this program.

1. Please briefly describe the program for which you are applying for support.

This is a graduate/undergraduate-level research program jointly conducted between Computing & Software Systems Program (CSS), University of Washington Bothell and Computer Science Department, Shizuoka University, Japan, regarding an integration of sensor network into cloud computing.

Prof. Munehiro Fukuda has led a grid-computing research project at UW Bothell for the past nine years, in particular funded by NSF for 2005 – 2007. He involved 25 undergraduate students in his project that actually developed a middleware system named AgentTeamwork. The key idea was using mobile agents, (programs capable of migrating over Internet) in order to dispatch and move user applications to faster and more reliable computers for performance and fault-tolerance purposes.

Prof. Takashi Watanabe has supervised 10+ graduate and undergraduate students every year at Shizuoka University for their research on sensor network and ubiquitous computing. Their research has been applied to traffic services and automated environmental monitoring.

Our proposed faculty-led program intends to prototype a cloud-computing environment across the two campuses, each provided with sensor network and server computers, where various types of sensor data will be optimally forwarded to applications in need for on-the-fly analysis and mining, which thus requires dynamic program executions over the two campuses. We are planning to engage our students in this sensor-cloud system implementation through several courses: CSS497 Cooperative Education, CSS499 Undergraduate Research, and CSS700 Master Thesis at UW Bothell as well as BS and MS Theses Research at Shizuoka University. Teaching and research outcome obtained through this program will be used for designing a new master's course on grid/cloud computing that will be given in spring 2011. We are planning to carry out this project for one year starting from summer 2010.

2. How does the program contribute to the mission of the Department, School or College?

UW Bothell emphasizes and encourages, in its mission statement, building a learning community of multicultural, collaborative, cross-program, and international diverse perspectives. From this viewpoint, we made an academic exchange agreement with Ehime University in 2003. Since then, we formally and informally exchanged four Ehime and three UWB students for their long and short stays.

The CSS learning objectives include learning by doing, collaboration and team building, and collaborative programming techniques. Based on these objectives, CSS played an important role for facilitating this student exchange by involving the Ehime students in Prof. Fukuda's grid-computing research project as well as allowing the CSS students to study distributed computing at Ehime for the purpose of fulfilling their CSS497 and 499 course requirements.

While our student exchange has been carried out in success, leading to conference presentations and even journal paper publications, we would like to extend our academic-exchange opportunities to other universities and a wider range of different research areas. In fact, one of CSS graduates is currently pursuing his MS degree at a different school, (i.e., Graduate School of Media and Governance, Keio University) and conducting multimedia database research.

Collaboration with Shizuoka University would greatly contribute to our needs for expanding academic-exchange opportunities due to the following reasons: (a) Prof. Watanabe's group at Shizuoka University specializes in sensor network and ubiquitous computing, which would help us enrich and design new courses; (b) they have experiences in sending their students to universities in US and Canada, which could make student exchange easier; and (c) their campus is located near by a big industrial area including Yamaha and Toyota, which would give our students a broader view of high-tech industries that are not IT but heavily need computing technologies.

3. How does the program directly benefit undergraduate and/or graduate education at the University of Washington?

The proposed sensor-cloud integration project would benefit the UW education from the following two perspectives:

1. Undergraduate and graduate student supervisions through CSS497, CSS499 and CSS700
CSS497: Cooperative Education is our capstone course in that all CSS students need to take an internship in the computing industry or to engage in a joint research project. CSS499: Undergraduate Research involves students in faculty research. The proposed faculty-led program would certainly give our undergraduate students more CSS497/499 opportunities, particularly trans-pacific work experiences.

Last autumn, CSS launched a master's program that requires all students to take either a 10-credit thesis (CSS700) or project. Regardless of writing a thesis on synthesizing/analyzing/testing a new idea or producing a product through the project, our faculty-led program would heavily involve MS students in this sensor-cloud project that would result in proposing, implementing, and verifying new algorithms and system architecture, all useful for integrating sensor-network into cloud computing.

2. A new course design to be given in Master of Science in Computing & Software Systems (MSCSS)
Prof. Fukuda will be giving a new 500-level course on grid/cloud computing in spring 2011. Due to the nature of cloud computing, the course must deal with not only principal concepts of computing job/resource parallelization, coordination, and virtualization, but also a broader view of closely related technologies such as sensor network, ubiquitous computing, and mobile computing as well as practical case studies. Our faculty-led project would facilitate Prof. Fukuda's course design by reflecting to the course a plenty of new knowledge and facts broadly, experimentally, and empirically obtained from the proposed sensor-cloud research.

4. How will the requested grant funds be used to benefit students through academic activities related to the coursework of the program?

We are planning to use the grant funds for the following three purposes:

1. Student travel support: \$2000

We would like to partially support two Shizuoka University and UWB graduate students for their four-week visit to each other's campus in summer 2010 or 2011. The actual supports are intended for their flights: \$1000 x 2 students = \$2000.

2. Conference registration support: \$1800

We will encourage MSCSS students to present their work at conferences such as (a) PacRim: Pacific Rim Conf. on Communications, Computers and Signal Processing in August 2011 at Victoria, BC, (b) GCA: Grid Computing and Applications in June 2011 at Las Vegas, and (c) ICMU: Int'l Conf. on Mobile Computing and Ubiquitous Networking, probably in 2011 or 2012. (Note that Profs. Watanabe and Fukuda are serving on the ICMU committee.) We would like to support their conference registrations: \$600 x 3 students = \$1800.

3. Instrument purchases: \$1200

CSS has two clusters of 32 Linux machines, (thus in total 64 computing nodes). Shizuoka University has various sensor-network prototypes. We will utilize these existing resources for the proposed project. However, from the viewpoints of sensor-cloud integration, we need more computing resources and sensors to be distributed across the two campuses. For this purpose, the Bothell site would like to have the two more instruments below:

- (a) Four or five packs of multi sensor boards: \$740, (e.g., EasySen's SBT80 – Multi Modality sensor board).
- (b) A commercial cloud site for testing our sensor-cloud integration: \$460, (e.g., Amazon Elastic Compute Cloud, high-CPU reserved instances 1-year term).

4. DEPARTMENTAL APPROVAL

By signing this letter, I acknowledge that I have reviewed the attached application for a Provost International Grant and approve of the program and grant request outlined above.

Applicant

Signature

Munehiro Fukuda
Print Name

Date

Home Department Chair

Signature

Michael D. Stiber
Print Name

Date