Idaho IGEM Program

Progress Report Form

Proposal No. IGEM13-003

Name: Dr. Jim Alves-Foss

Name of Institution: University of Idaho

Project Title: IGEM Proposal: Multidisciplinary Cyber-Security Faculty Cluster Hire

Reporting Period: August 2013 - June 2014

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Information to be reported in your progress report is as follows (attach additional information as needed):

1 Summary of project accomplishments for the period just completed and plans for the coming reporting period:

1.1 Summary

The focus of this project is on the hiring of several faculty in a multidisciplinary cyber-security cluster, with the intent of expanding current faculty with a cadre of new faculty. This group will then pursue new external funding opportunities for on-campus research and also pursue collaboration with Idaho and regional industry. These activities are based on the 4-phase approach outlined by the successful USTAR program: grow research team, grow extramural funding, develop technology and then commercialization. We are in the active stages of the earlier phases, and have had success in growth of extramural funding. As with USTAR, this growth is expected to occur over many years.

In November 2013 we submitted a project and budget modification proposal to HERC in response to a request to address shortfalls in expenditures. This modification included a reallocation of unspent funds to focus on accelerating industry collaborations in FY 14, and a reduction in total requested funds for combined FY 13-14 budget. We were informed that this re-budget was approved on November 22nd.

To date the primary focus of the project has been on searches for new faculty and staff hires. These hires are enhancing research capacity at the University of Idaho. The progress of these searches is as follows:

4 New Full-Time Faculty Hires

- Computer Science Assistant Professor. Dr. Daniel Conte de Leon
- Sociology Assistant Professor: Dr. Kristin Haltinner.
- Civil Engineering Assistant Professor: Dr. Kevin Chang
- Electrical Engineering Assistant Professor: Dr. Sara Eftekharnejad

Additional Hires:

- Visiting scholar (temporary). Dr. Xia Yang from University of Electronic Science and Technology of China. We had a unique opportunity to bring aboard a visiting professor from China. Most of her pay came from the Chinese government. We provided $9,500 toward her salary. She acted in a consulting capacity assisting us in reviewing how we work with industry and technology transfer. In addition, her expertise in secure operating systems was a benefit to this project. Although she has now returned to China, we anticipate working on establishing a long-term relationship with her home university. We have already submitted three joint research papers with her and are looking at more before the year is out. We have begun discussion of joint patent and funded research.

- Rebecca Crellin was hired Spring of 2014 as a staff researcher. She started full time work at the end of March 2014. She is working with student developers to enhance existing research products toward the goal of technology transfer and potential commercialization. Starting July she is also assisting with externally funded projects.

- Dr. Carlos Rivero was a postdoctoral researcher funded 50% time on IGEM funds and 50% on a federal research grant through June 2014. Dr. Rivera's research focused on information interchange, data exchange, and linked data. He worked with us on expanding expertise in large database systems and security aspects related to databases.

- Student and staff researchers. From this project, and with funding from related projects we have hired or provided funding for 27 students.

Active Search

- Computer Science joint hire position. INL agreed to fund 50% of this position for an assistant professor to be housed in Idaho Falls. After on-campus interviews our top candidate declined our offer; other candidates either pulled out or were deemed no suitable for the position. We are continuing the search for other candidates.

In addition to the faculty hires, we have expanded out outreach activities with industry. This included a conference in Moscow Idaho, a series of web-based lectures, meetings with industry partners, and joint proposal submissions. Details are provided in Section 6.

1.2 Plans for Coming Period

During the coming period we plan the following:

- Complete the hiring processes.
- Submit multiple proposals for external funding to support research of the current group as well as the new faculty.
- Build partnerships with industry (see section 6 of this report for details).
- Continue to mentor the new faculty hires.
- Convert existing research technologies into technologies that we can start demonstrating to industry to foster technology transfer, product development and partnerships.

2 Summary of budget expenditures for the period just completed (include project burn rate):

The following expenditures represent the current salary expenses for the IGEM team, travel related to IGEM, hiring expenses to date (through June 2014).

Category	Expenditures through June 2014	Budgeted for FY 2013-14	Burn Rate (% Contract to Date)
Salaries	$ 573,400	$616,000	93%
Travel	$ 59,400	$50,000	119%
Search & Moving	$ 56,700	$48,000	118%
Operating Expenses	$ 113,400	$95,000	119%
Startup	$ 152,200	$163,900	93%
Equipment	$ 70,800	$70,000	101%
Total	**$ 1,025,900**	**$1,042,900**	**98%**

The reallocation of funds authorized November 22nd resulted in increases in salary expenditures starting mid January 2014 (with the start of the semester).

The budget submitted in November included expenditures for new faculty hires that could have started this FY (e.g., our top candidate in the CS search expressed interest and availability to start in April, prior to declining our offer). The lack of expenditures for the new hires resulted in residual funds of $17,000.

3 Numbers of faculty and student participation resulting from the funding, including internships:

- Faculty participation through June 2014: 15 (7 directly funded – 3 of these started funding in January, 8 others have been involved in grants activities, travel, and student/new faculty mentoring).
- Student participation through June 2014: 27 (these students are at least partially funded through faculty start-up funds, IGEM software development efforts, and related grant activity tied to IGEM faculty and departmental funds).

4 List patents, copyrights, plant variety protection certificates received or pending:

None at this time.

5 List technology licenses signed and start-up businesses created:

None at this time.

6 Status of private/industry partnerships (include enough information to judge level of engagement):

All faculty involved in this project have been involved in discussions with industry and or government partners. These include discussions of joint research work, research/service work utilizing our new laboratory equipment, and partnerships in outreach to the general community. A representative list of these interactions are included below.

6.1 Industry Collaborations

6.1.1 Research Partnerships

The following companies have expressed interest in partnering with IGEM faculty on research projects. Avista corporation has already provided funding for their joint activity.

Avista Corporation: We have been working with Avista with a number of project proposals. They have funded one project for $80,000 in support of research affecting the stability and reliability of the powergrid.

Rocky Mountain Hardware, Haley Idaho. We are in discussions regarding an agreement with this lock manufacturer to help them develop new technology for smart door locks – those that have internet access capability, authentication and identification features and cyber security.

Frontier Communications: This national company, with a large Idaho impact, is very interested in working with us on improving security for corporate customers who use their communication services. We are working through negotiations of a confidentiality agreement and outlining a work plan. Current discussions are focused on outlining a research plan.

Itron, Inc., Liberty Lake Washington: Although this global company headquarters its security division in Washington state, at a facility that employs over 1,000 people, many who live across the border in Idaho. We are in negotiations with this company to obtain donations of a smart meter testing lab, and a confidentiality agreement. Discussions have already lead to a preliminary idea for a new software capability that could lead to a start-up firm. In addition we are discussing a lab donation to provide UI faculty and students access to state-of-the art smart meters.

6.1.2 Laboratory Partnerships

The following companies have expressed an interest in partnering with us in research and/or service activities utilizing our new laboratory equipment.

Distributed Database Consulting Inc (DDBC), Boise Idaho: We have a signed a confidentiality agreement with the CEO of this company. DDBC owns eHealthApp, a company that provides technology which enables insurance brokers to streamline their processes by removing many of the inefficiencies in largely paper-based processes of quoting and enrolling customers for small and medium size businesses. We are working with them to evaluate the security of their

applications and websites, and using this real-world application as a training vehicle for our students.

Chief Architect: Coeur d'Alene based Chief Architect Software is a leading developer and publisher of 3D Architectural home design software for builders, designers, architects and home DIY enthusiasts. They are interested in setting up a cloud-based solution for their customers and would like to work with us on helping them evaluate performance and security aspects of such a service.

Murdock Charitable Trust: The trust provided us with a $240,000 grant to support development of an adaptable computation server that provides us with the ability to provide large-scale modeling of complex scientific problems, including cyber security network analysis, and critical infrastructure modeling.

Schweitzer Engineering Laboratory (SEL): Engineers at SEL are interested in help developing algorithms and processes for examining large amount of power-grid related data for improving the stability of the power grid. They believe that we may be able to use our new laboratory equipment to provide them the solutions they are seeking.

Hewlett Packard (HP): We have had discussions with HP's Boise-based printer division, specifically the computer security group. They are interested in establishing a partnership with us in support of the security analysis of software solutions for their printers, from enterprise level print management down through personal computer solutions.

6.1.3 Education and Outreach:

The following company has expressed an interest in working with us in development education and training material, and providing that material to Idaho businesses..

XO Communications. We are working with several individuals at XO communications. XO is a provider of telecommunications solutions to a number of Idaho based companies. They are working with UI to develop cyber security training materials for Idaho companies. They are also willing to work with us on presenting the materials as part of a "road show" where we provide regional training seminars.

6.2 Government (and Government-like) Partnerships

In addition to our industry partnership activities, we have been exploring the following government partnerships:

Idaho National Laboratory The INL is partnering with UI in several aspects of the IGEM initiative. INL is funding 50% of one of the IGEM faculty positions, to be based in Idaho Falls. INL has also partnered with UIdaho IGEM faculty on multiple grant proposals for federal funding. We have been involved in continuing discussions with them, which include a visit to Moscow on July 29th and a joint summit on cybersecurity with faculty from Idaho State, Boise State and UI at the INL facilities.

Pacific Northwest Laboratory: The PNL is partnering with UIdaho IGEM faculty on multiple grant proposals for federal funding. We are actively engaged in developing another proposal due end of May.

Other Government Agencies: We have had several other meetings and presentations with industry and government partners in the region as well as with NSF, DARPA, NASA and DHS with specific discussions related to multidisciplinary cyber-security research and for critical infrastructure research. These discussions are leading to several proposals being submitted this year to expand our research in these critical areas. The program managers at these agencies are very interested in the UI's approach to the faculty cluster hire and the research directions we are proposing.

6.3 Additional Industry Outreach

Cyber Security Seminar: Starting January 2014, we started providing a seminar series on cybersecurity. This series consists of a collection of academic research talks, industry presentations and how-to tutorials. We are videotaping these talks and are making them available on-line so that Idaho industry can view them. Currently the videos can be found linked from our main website (http://www.csds.uidaho.edu) and on YouTube:

https://www.youtube.com/channel/UCv1K9ziCFbyd8YY7aX9jNZQ

Cyber Security Symposium Public-Private Partnerships: On April 8th, 2014 we hosted a cyber symposium in Moscow Idaho. We put the call out to academics, students, industry and government to attend. We had attendance from academics from Idaho and Washington, business from the region and also some government representation. A total of 42 people attended. During the conference we had an industry panel discuss ways in which the University of Idaho can partner with industry, beyond our traditional education mission. This discussion has resulted in several follow-up conversations and potential future work. We plan to host a similar even in Spring 2015.

Advisory Board Meeting: On May 2nd the Computer Science Advisory Board and the NIATT advisory boards met. One topic of discussion was the follow-on to the symposium discussion, how can University of Idaho partner with industry, beyond our traditional education mission. This discussion led to several future discussion threads, including non-traditional education activities.

7 Additional Metrics

7.1 University support of research centers and institutes: Center for Secure and Dependable Systems, National Institute of Advanced Transportation Technology.

University of Idaho has provided funding for operation and management of NIATT and CSDS. Specifically, University of Idaho has provided funds to the centers as a percentage

of F&A generated, and salaries for management staff of the centers. This is in addition to support from centralized ITS and sponsored programs operations

FY 13 funding: $330,000 -- included wrap up of one-time funds from restructuring
FY 14 funding: $230,000
FY 15 funding: $240,000 (estimated)

External funding for faculty/staff researchers

In addition to direct university funding of the centers, external research grants and contracts have resulted in an additional funding for cybersecurity faculty and staff researchers during FY 13 - 15. This does not include funding from on-going DoT grants and contracts in NIATT that are not cybersecurity related, nor other grant related expenses including student support, equipment and travel.

FY 13 ($90.1 K)
Salary : $49,000
Fringe : $13,100
F&A : $28,000

FY 14 ($106.6K)
Salary : $58,800
Fringe : $14,800
F&A : $33,000

FY 15 (projected from current sources) ($140K)
Salary : $75,600
Fringe : $21,000
F&A : $43,500

7.2 University funds used for fringe benefits of faculty hires, startup and laboratory equipment costs, office and laboratory space provided by institution.

University has committed an additional $50,000 for start-up funds for the new faculty hires. In addition, the university has committed to providing additional start-up funds for new faculty hires based on the amount of external funds and F&A they generate over their first 5 years on campus – up to an additional $300,000 combined.

University has expensed $134K in fringe benefits for IGEM personnel.

University has provided office space for all new hires.

7.3 Number of workshops and conferences that bring academia an industry together (include number of participants)

As discussed in section 6.3.

- One in town conference -- including 42 participants.
- Regular on-line seminar series (6 lectures so far) -- on campus attendance ranged from 10-20 participants. Videos online through different venues.
- Provided 5 separate presentations to industry groups around the state. Total attendance over 100.

7.4 Progress on establishment of software security testing laboratory

Isolated software security lab is complete.

- Includes high power servers for simulations
- Includes large disk array
- Reconfigurable

Network accessible security lab is almost complete – for use in training and cyber-security attack defense labs.

High memory simulation computers are installed

- Allows for simulation and modeling of complex infrastructures as well as other modeling projects.
- Several industry partners are discussing use of facility.

8 Any other pertinent information that will indicate to the council that the project is meeting satisfactory progress.

We were optimistic in the hiring timetable by hoping that the funds would be made available by July 1, 2012 and that all searches would move smoothly. We are on track for hiring a good cadre of faculty, with four really good hires already, and with good research staff hires.

Dr. Alves-Foss and Dr. Conte de Leon received a $444,000 grant from the federal government (funding is for calendar year 2014) for cybersecurity research related to industrial technologies. The proposed research is a direct extension of earlier work performed by Dr. Conte de Leon.

Dr. Alves-Foss and Dr. Oman received a performance-based renewal of the Scholarship for Service program ($510,000 funded in Summer 2013). This project provides full-ride scholarships for students for 2-3 years in return for an equivalent amount of service in federal, state, tribal or local government. IGEM funding was important to the performance review.

Several faculty participated in the submission of proposals for development of an adaptive computation server that provides us with the ability to provide large-scale modeling of complex

scientific problems, including cyber security network analysis, and critical infrastructure modeling. This project has been funded at a level of $540,000.

IGEM faculty in CSDS, NIATT and Electrical Engineering have also participated in the submission of proposals for external funding. Proposals requesting over $2M in research funds are still outstanding. More proposals are being developed and will continue to be developed over the summer.

NIATT faculty are continuing work with existing DoT grants and have submitted proposal for future work that include cybersecurity for critical infrastructure.

Summary of total new external funding received by IGEM affiliated faculty since start of the IGEM project (July 2012), totaling over $1.M:

- $510,000 in NSF scholarship for service funds, which includes $30,000 in laboratory improvement funds
- $440,000 in a federal cyber security research grant for calendar year 2014
- $130,000 accomplishment-based renewal
- $300,000 in NSF funds to support major research laboratory equipment purchase
- $240,000 Murdock Foundation grant to support major research laboratory equipment purchase
- $80,000 Avista cooperative research grant

USTAR Metrics:

Since the IGEM program is based on the USTAR program, it is instructive to look at the USTAR performance compared to IGEM participant performance. Data for the USTAR program can be found in the Utah Bureau of Economic and Business Research report[1] on the economic impact of USTAR during the first five years of operation as well as the USTAR annual reports, specifically the 2009 report[2] (after three years of operation) and the most recent calendar year 2012 report[3].

USTAR started in 2007 with 8 research teams and has now grown to a total of 21 teams. On average, USTAR has committed approximately $1.3M per year to each of the research teams, with a current annual investment of $23Million. Over the first several years of team building the USTAR teams have traditionally carried over a significant portion of these funds. The ability to utilize carry over funds is essential for academic research organizations that do not have access to loans from financial institutions, or funds from investors that can be used for long term hiring and planning. The stability of these funds increases confidence of new recruits.

Over the first five years, the USTAR teams hired 22 senior faculty and now supports128 FTE researchers, including junior faculty, for an average of 6.5 funded researchers per $1M in USTAR investment).; this includes those hired on external grants. In comparison, the University

[1] http://www.innovationutah.com/assets/USTAR_Econ_Contributions-BEBR-042712.pdf - economic analysis
[2] http://www.innovationutah.com/assets/USTAR-Annual-Report-2009.pdf - 2009 annual report
[3] https://secure.utah.gov/ustar-admin/documents/205.pdf - 2012 annual report

of Idaho IGEM program is currently supporting 7 FTE in faculty and research staff per $1M in IGEM investment, and also many student researchers.

The USTAR teams have cumulatively obtained $69M in external funds over the past 5 years, averaging $730K per $1M of investment. In the first two years of team building, the teams averaged under $170K in external awards per team. In the third through fifth years of the USTAR program, their research teams averaged $1M in external funds per $1M in investment. As a comparison, the UIdaho research team has secured over $1.5M in external federal and industry funding for the first $1M in IGEM investment, during the first two years of this program. We anticipate continued success with continued IGEM support .

The USTAR research teams' total expenditures (from both state USTAR investment and external funding sources) reached an amount equivalent to 100% of annual state investment in the second year and grew to an average of 200% of annual state investment in the third through fifth years, some of these expenditures were from carry over funds and the rest from external grants. As a comparison, the UIdaho research team's total expenditures for the first two years are expected to exceed 250% of the state's revised investment. The total expected IGEM team expenditures for FY13 and 14 will exceed $2.5M; external funds will account for $1.35M of that total, internal university funds will provide $150K and IGEM funds account for the remaining $1M.

This quick summary illustrates that the UIdaho IGEM team is following the trajectory of the USTAR program, exceeding that program's start in many metrics. The intent of the USTAR and UIdaho programs has been to build a research program following a four phase approach (see illustration on page 4 of the USTAR 2009 report): Phase 1: Research Teams (and for USTAR -- buildings); Phase II: Extramural Funding Growth; Phase III: Technology Development and Phase IV: Commercialization. These phases are not necessarily sequential, but rather take place along a continuum, with initial progress on later phases as earlier phases mature. A trajectory being matched by the UIdaho IGEM project.

A continued investment in the University of Idaho IGEM project will enable us to continue the growth of the cyber security research team at University of Idaho along this winning trajectory. We anticipate continued growth in external research funds, enhanced research activities, and enhanced growth of partnerships with industry. In the years to come, with continued investment, we will continue on the USTAR-style trajectory with success in all phases.