

Security Management of Cyber Physical Control Systems July 2016-June 2019

**State Board of Education
Higher Education Research Council
Idaho Global Entrepreneurial Mission (IGEM) Initiative Grant**

Grant Number IGEM17-001

University of Idaho, College of Engineering

Project Director and PI: Larry Stauffer, Dean

Co-PI's: Fredrick Sheldon, Chair and Professor, Computer Science
Brian Johnson, SEL Endowed Chair, Electrical & Computer Engineering
Michael Haney, Assistant Professor, Computer Science
Daniel Conte de Leon, Assistant Professor, Computer Science

Executive Summary

Cyber-attacks and intrusions are nearly impossible to reliably prevent given the openness of today's networks and the growing sophistication of advanced threats. Knowing the vulnerabilities is not adequate, as the evolving threat is advancing faster than traditional cyber solutions can counteract. Accordingly, the practice of cyber security should focus on ensuring that intrusion and compromise do not result in business damage or loss through more resilient solutions. We are creating a platform to facilitate and build complementary and multidisciplinary R&D capabilities to address these pressing problems. Our platform will incubate innovative products and services for safeguarding cyber physical control systems (CPCSs) that are ubiquitous and underpin key sectors of our economy. Early participation of industry will aid in vetting promising technologies. Better methods for assessment combined with more resilient systems design will safeguard against potentially immense economic impact currently being faced by Idahoan stakeholders.

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**Security Management of Cyber Physical Control Systems
July 1-December 31, 2017**

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I. Summary of Project Accomplishments and Plans

This report provides the status of the project titled “Security Management of Cyber Physical Control Systems” which is an Idaho Global Entrepreneurial Mission (IGEM) Initiative Grant # IGEM17-001 sponsored by the Higher Education Research Council (HERC) of the Idaho State Board of Education (ISBOE). We are concluding the first six-months (July 1-December 31, 2016) of this three-year project. As we are just initiating the project most of the effort has been towards planning and building capabilities of cyber physical control systems (CPCS).

During the next six-month period, January 1-June 30, 2017, we plan to continue with our work plan as described in the proposal. Specifically we plan to complete the hiring of faculty and graduate students. With regard to infrastructure enhancements we plan to complete the video technology room in Idaho Falls and initiate improvements to the laboratories. We will also make preparations for year two activities.

II. Budget Expenditures

Expenditures July 1 - December 16 2016					
Category	Approved	Expenditure	Encumbered	Remaining	Notes
Faculty Salaries	\$180,029	\$ 69,818		\$ 110,211	
Fringe Benefits	\$ 41,439	\$ 20,410		\$ 21,029	
Travel	\$ 18,500	\$ 10,290		\$ 8,210	
Operating	\$141,732	\$ 2,149	\$ 175,200	\$ (35,617)	VT instalations in Moscow and Idaho Falls; note 1
Capital Outlay	\$297,000		\$ 304,000	\$ (7,000)	Power lab enhancements; note 2
Tuition	\$ 21,300	\$ 5,194		\$ 16,106	
Total	\$700,000	\$ 102,667	\$ 479,200	\$ 118,133	

Note 1: The \$175,200 is the set aside amount for the Video Technology installations. The entire project is not scheduled to be completed until March 15, 2017 at which time an accurate expenditure will be recorded. We may be requesting adjustments between the Operating and Capital Outlay categories at a later date. Regardless, we will not exceed the budgeted amount.

Note 2: The \$304,000 is the initial estimate towards the Murdock proposal (discussed later in this report). We won't know the exact amount until the end of May. We may be requesting adjustments between the Operating and Capital Outlay categories at a later date. Regardless, we will not exceed the budgeted amount.

III. Demonstration of Economic Development/Impact

In this section we detail our accomplishments, organized by the four Objectives of the project.

(1) Strengthen our capacity by adding key faculty and enhancing laboratories.

In this first six months of the project we have made substantial progress on video technology infrastructure additions and initiated laboratory enhancement projects. We have been able to add one new faculty member and assign an additional portion of time for three existing faculty

members. We also initiated a search for the other three faculty members called for in the proposal and hired a graduate student. A summary is as follows:

III.1.A Faculty Searches

Our work plan calls for the hiring of four faculty members. We have been fortunate to already have completed one of the hires in Electrical and Computer Engineering (ECE) in Moscow. Yacine Chakhchoukh is an expert in signal processing with experience in power systems cyber security operations. He earned a PhD in 2010 from Paris-Sud XI University/Superior School of Electricity, Supélec (Paris, France) with highest honors. Prior to joining the UI he was an assistant professor at the Tokyo Institute of Technology.

We are currently conducting searches for the following three remaining positions. They will all begin work fall semester 2017 if the searches are successful.

- Assistant Professor in Computer Science in Idaho Falls; expertise in security in internet of things.
- Assistant Professor in Electrical and Computer Engineering in Idaho Falls; expertise in SCADA.
- Associate Professor in Computer Science in Moscow; expertise in cyber security of cyber-physical controls systems.

II.1.B Graduate Students

Currently one graduate student has been hired for the project, Krishna Koganti. He is currently working on the VMWare based Industrial Control Systems (ICS) Testbed project (described below). A new PhD student in CS, Mohammad Ashrafuzzaman, is assisting Krishna and will assume responsibility for conducting the first research on this testbed this coming summer.

III.1.C Video Technology and Laboratory Enhancements

In our proposal we projected to enhance equipment and facility improvements to better connect UI faculty and laboratories in Moscow and Idaho Falls and faculty at Boise State University.

Video Technology Connected Classrooms and Laboratories

Through an unrelated initiative we are expanding our computer science program to the UI's Coeur d' Alene campus which contains a sub-area of cyber security. So we are coordinating this expansion with our IGEM initiative to create a state-wide video technology system with these four locations and utilizing the Idaho Regional Optical Network (IRON) network. In this system we will have connected classrooms for sharing courses and seminars between UI Moscow, Idaho Falls, and Coeur d' Alene and Boise State University. We will also have connected cyber security laboratories for shared resources and collaboration between these same sites. Figure 1 demonstrates this concept. Figure 2 shows the operational classroom in Moscow with a similar classroom in Coeur d' Alene which became operational December 1, 2016. The other locations are scheduled to become operational in 2017.

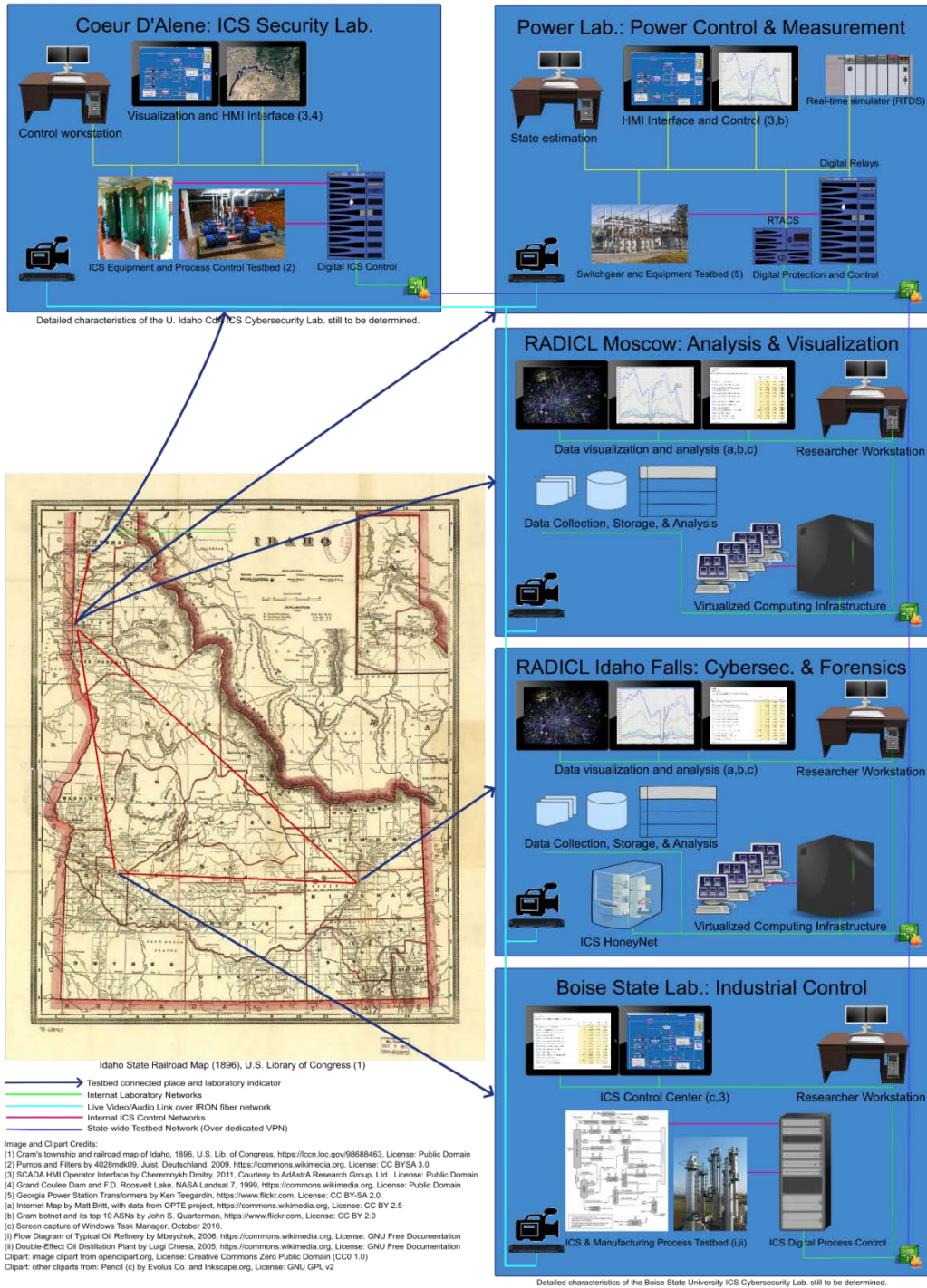


Figure 1: Conceptual View of the New Connected Idaho CPS Cybersecurity Laboratories



Figure 2: View of Front of the New Video Enhanced Classrooms at UI

The Power Systems Laboratory in Moscow is undergoing a major expansion from about 1,500 sq.ft. to 2,200 sq.ft. (see Figure 3) We have worked with the Schweitzer Engineering Laboratory (SEL) Engineering Services Division to design a testbed for performing research on cybersecurity of power and industrial control systems. This testbed will allow research and development of novel and secure techniques and algorithms for securing today and tomorrow's Power Grid (PG) along with other types of Industrial Control Systems (ICS). The major advantage of this testbed is that it will enable researchers and engineers to perform and collaborate on ICS-specific cybersecurity research, development, and testing on a system that closely resembles current distributed critical infrastructure cyber-physical control systems. The proposed testbed will expose hardware-in-the-loop, enable the capture and use of real operational data, integrate current and future components of the power grid and other industrial control systems, and enable realistic attack-defend scenarios for research, evaluation, and testing. It will integrate with the current Real Time Digital Simulator (RTDS) and be accessible from the other UI locations as well as BSU. This capability will significantly enhance our ability to demonstrate (in-situ) advanced PG/ICS technology to Idaho industry partners. The expansion is illustrated in Figure 3 below. The estimated cost of this enhancement and expansion is about \$925,000. This cost will be funded by a combination of funding from this IGEM project, the Murdock Foundation, and other COE funds. In case we are not successful with the Murdock Foundation request, we are developing a "Plan B" for a significantly scaled back test bed. We will still expand the size of the Power Systems Laboratory but will have to keep the scope of the test bed more focused initially and build out the other equipment over time.

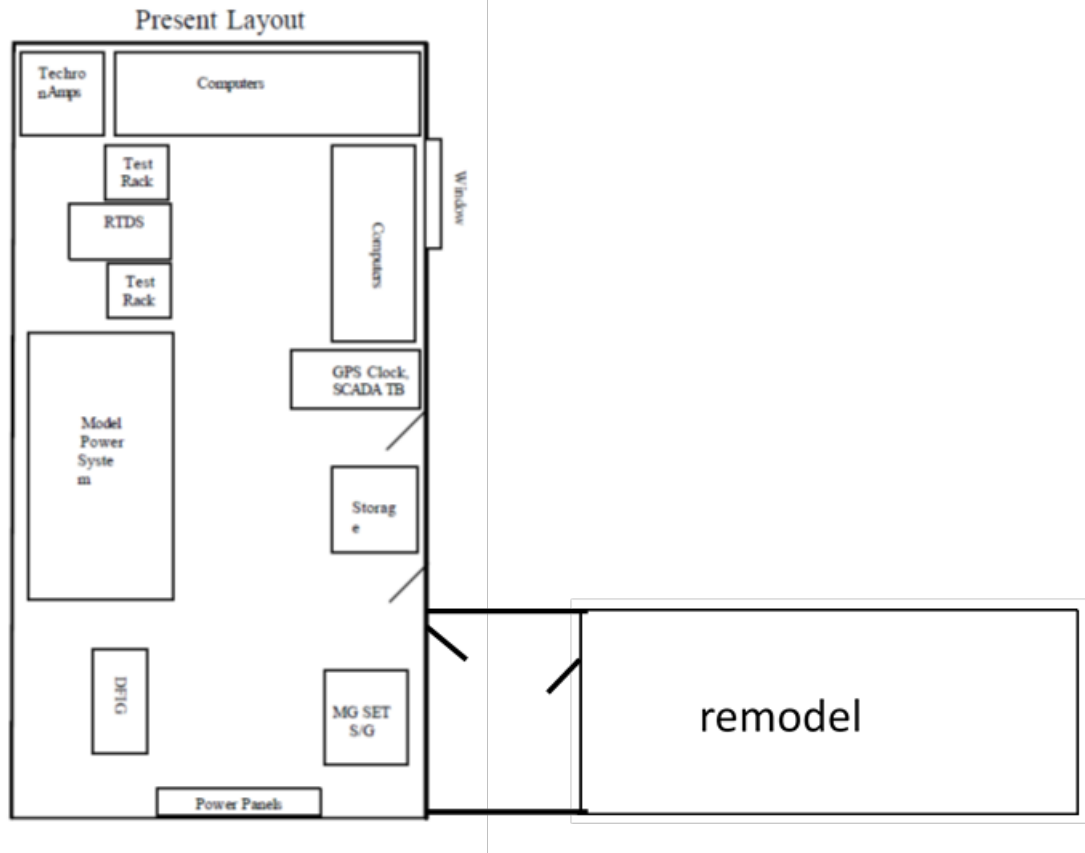


Figure 3: Illustration of Power Systems Laboratory Expansion

VMware based Industrial Control Systems (ICS) Testbed

We have developed plans to install a VMware based Industrial Control Systems (ICS) Testbed – Including datasets from DHS/NSF Sponsored Predict/Impact. This step is planned for March in conjunction with a visit from Prof. Q. Chen who will give a colloquium and provide technical assistance installing software for this purpose. In anticipation of these facilities we are working with students from the Power Systems Laboratory to develop a strategy to collect data that can be used for the purpose of applying machine learning techniques to forewarn of failures including security breaches and insider threats. Two students are working on this effort Krishna Koganti (MSCS) and Mohammad Ashrafuzzaman (PhD in CS). We have established an IMPACT account with the DHS sponsored site <https://www.impactcybertrust.org/>.

(2) Strengthen collaboration with Idaho industry and other Idaho universities

III.2.A Industry Collaborations

September 16, 2016: Rear Admiral Kevin Kovacich. RADM Kovacich is the Director of Plans and Policy (J5) at the United States Cyber Command, Headquarters, at Fort Meade Maryland. During his visit to the University of Idaho he met the faculty and gave a presentation to faculty and cybersecurity students.

September 28, 2016 Idaho National Laboratory (INL), Homeland Security Division (Agenda in Appendix A). Our IGEN team met with members of the INL to review the objectives of the

IGEM project, learn more about the mission of the INL in this area, and identify opportunities for collaboration. The outcomes of this meeting are still on-going.

November 9-10, 2016, with follow up visit on December 1: James Brainerd of Inergy Solar of Pocatello Idaho. The objectives of this visit included (1): progress review on existing Idaho Department of Commerce IGEM grant, (2) tour of RADICL and ECE labs as part of discussions for future research proposals. Drafted letter of intent for SBIR proposal to US-DOE.

December 15-17, 2016: Hideaki Ishii, Associate Professor, Tokyo Institute of Technology (Japan). The objective of the visit was to strengthen our collaboration on research, publications, and supervising students in the cybersecurity area.

Michael Haney partnered with Idaho Falls Power to establish Memorandum of Understanding for course offerings and future research partnerships.

Brian Johnson has had weekly meetings with Craig Rieger and Tim McJunkin from INL related resilient control of critical infrastructure. Efforts included (1) ongoing research project as part of DOE Grid Modernization Lab program (2) collaboration course on Resilient Control Systems with collaboration between UI, BSU and INL. Some interaction with Colorado State University and Idaho State University as well.

III.2.B University Collaborations

July 2016: nuclear cybersecurity research meeting in Idaho Falls with University of Tulsa and the INL led to two NEUP proposals with Michael Haney as the PI.

September 27, 2016: Boise State University (BSU) College of Engineering (Appendix A) Our IGEM team met with faculty and staff at BSU to review the objectives of the IGEM project, identify opportunities for collaboration, discuss how to enhance labs at both schools, and increase connectivity. At the conclusion of this meeting we agreed to visit again in Moscow.

November 10, 2016: Boise State University (BSU) College of Engineering (Appendix A) Faculty and staff from BSU met with our IGEM team in Moscow to review work done since the last meeting, tour labs, and identify swim lanes for developing complementary laboratory focus areas. Some decisions made were to duplicate our RADCL lab at BSU, develop a common policy and protocol for remote lab operation at both programs. While we will focus on power systems security, especially regarding transmission and distribution, BSU expressed an interest to focus on security of alternative power generation. Additional outcomes of this meeting are still on-going. BSU will also plan to implement video technology to be compatible to our system being installed in order to create a broader state-wide system as described above.

(3) Foster technology transfer and commercialization through technology incubation

In our proposal we stated that accomplishments in this Objective would not occur in the first year. However, our team has already made some progress, namely:

III.3.A Proposals

ACCEPTED

1. B.K. Johnson, "Resilient Scalable Cyber State Awareness of Industrial Control System Networks to Threat: Power System Design and Testing," Idaho National Laboratory, January 11, 2017-January 10, 2020, \$75,000.
2. B.K. Johnson, "HVDC System Control Threat Model and Mitigation Method for Cyber Attack Resilient HVDC Systems," ABB Corporation (Subcontract of DOE CEDS grant). January 11, 2017-August 30, 2019, \$199,628 (plus an additional \$50,364 cost share).

SUBMITTED

"Idaho Industrial Control Systems (ICS) Cybersecurity Testbed"

Amount Requested: \$463,208

Proposed Period: June 1, 2017 to May 31, 2018 (1 year).

Proposed Source: M.J. Murdock Charitable Trust (www.murdocktrust.org).

Location: University of Idaho, Multi-site: Moscow, Idaho Falls, Coeur D'Alene, Idaho.

PI: Johnson, Brian; Ph.D., P.E., Electrical and Computer Eng., University of Idaho.

CoPI: Chakhchoukh, Yacine; Ph.D., Electrical and Computer Eng., University of Idaho.

CoPI: Conte de Leon, Daniel; Ph.D., Computer Science, University of Idaho.

Note: Total project cost is \$872,405 with match from the University of Idaho.

Note: This is a major instrumentation proposal to build a specialized Industrial Control Systems (ICS) Cybersecurity research, development, and testing distributed testbed. It includes no direct financial support for PI salaries. The testbed will be distributed across the state of Idaho with sites in Moscow, Idaho Falls, and Coeur d' Alene.

"Univ. of Idaho GenCyber 2017 Residential Cybersecurity and Coding Camps"

Amount Requested: \$79,813

Proposed Period: March 15, 2017 to March 14, 2018 (1 year).

Proposed Source: GenCyber Summer Camps Program, U.S. National Security Agency.

Location: University of Idaho, Moscow, Idaho, U.S.A.

Project Director: Conte de Leon, Daniel; Computer Science, Moscow, Univ. of Idaho.

Lead Instructor: Soule, Terry; Computer Science, University of Idaho.

Certified High-School Instructor: LaPaglia, Kirsten; TRIO Program, U. of Idaho.

Instructor: Heckendorn, Robert; Computer Science, University of Idaho.

"SaTC: EDU: Development of Reverse Engineering Lab and Curriculum"

Amount Requested: \$271,279

Proposed Period: October 1, 2017 to September 30, 2019 (2 years).

Proposed Source: NSF, Secure and Trustworthy Cyberspace, Education: SaTC:EDU.

Location: University of Idaho, Idaho Falls, Idaho, U.S.A.

PI: Haney, Michael; Computer Science, Idaho Falls, University of Idaho.

CoPI: Conte de Leon, Daniel; Computer Science, Moscow, University of Idaho

"NEUP NE-1: Analysis and Design of Future Digital Instrumentation and Controls for Nuclear Reactors"

Amount to be requested (approximate): \$800,000.

Proposed Period: July 01, 2017 to June 30, 2020 (3 years).

Proposed Funding Agency: Department of Energy Nuclear Energy University Programs (DOE NEUP).

Proposed Technical Workscope Identification: NE-1: Cybersecurity Research Topics

Submission Deadline: March 1, 2017.

Location: Center for Advanced Energy Studies, Idaho Falls, Idaho, U.S.A.

Planned Person-Months: for PI Haney: Academic Year: 0.50 month.

PI: Haney, Michael; Computer Science, University of Idaho, Idaho Falls, ID.

CoPI: Borrelli, R. A.; Nuclear Engineering, University of Idaho, Idaho Falls, ID.

CoPI: Hawrylak, Peter; Electrical Engineering, University of Tulsa, Tulsa, OK.

CoPI: Papa, Mauricio; Computer Science, University of Tulsa, Tulsa, OK.

CoPI: Hale, John; Computer Science, University of Tulsa, Tulsa, OK.

"NEUP NE-1: A Cyber-Secure Operator-in-the-Loop Nuclear I&C Architecture for Supply Chain Risk Management"

Amount Requested (approximate): \$750,000.

Proposed Period: July 01, 2017 to June 30, 2020 (3 years).

Proposed Funding Agency: Department of Energy Nuclear Energy University Programs (DOE NEUP).

Proposed Technical Workscope Identification: NE-1: Cybersecurity Research Topics

Submission Deadline: March 1, 2017.

Location: Center for Advanced Energy Studies, Idaho Falls, Idaho, U.S.A.

Planned Person-Months: for PI Haney: Academic Year: 0.50 month.

PI: Haney, Michael; Computer Science, University of Idaho, Idaho Falls, ID.

CoPI: Hiromoto, Robert; Computer Science, University of Idaho, Idaho Falls, ID.

CoPI: Vakanski, Alex; Industrial Technology, University of Idaho, Idaho Falls, ID.

CoPI: Ladendorff, Marlene; Idaho National Laboratory, Idaho Falls, ID.

III.3.B Publications

ACCEPTED

Stuart Steiner, Daniel Conte de Leon, and Jim Alves-Foss, "A Structured Analysis of SQL Injection Runtime Mitigation Techniques," **Proceedings of the 50th Hawaii International Conference on System Sciences (HICSS-50)**, 04-07 January 2017, Big Island, HI, U.S.A. IEEE Computer Society, 2017. <http://dx.doi.org/10.1109/HICSS.2017.TBD>.

Ananth A. Jillepalli, Daniel Conte de Leon, Stuart Steiner, and Frederick T. Sheldon, "*HERMES: A High-Level Policy Language for High-Granularity Enterprise-wide Secure Browser Configuration Management*," **Proceedings of the 2016 IEEE Symposium Series on Computational Intelligence (SSCI-2016)**, 06-09 December 2016, Athens, Greece, IEEE Computer Society, 2016. <http://dx.doi.org/10.1109/SSCI.2016.TBD>

Daniel Conte de Leon, Venkata A. Bhandari, Ananth A. Jillepalli, and Frederick T. Sheldon, "Using a Knowledge-based Security Orchestration Tool to Reduce the Risk of Browser Compromise," **Proceedings of the 2016 IEEE Symposium Series on Computational Intelligence (SSCI-2016)**, 06-09 December 2016, Athens, Greece, IEEE Computer Society, 2016. <http://dx.doi.org/10.1109/SSCI.2016.TBD>

Y. Chakhchoukh; V. Vittal; G. T. Heydt and H. Ishii, "*LTS-based Robust Hybrid SE Integrating Correlation*," to appear in **IEEE Transactions on Power Systems**, IEEE 2017.

P. Penkey, M. Alla, B.K. Johnson, T.R. McJunkin, "Improving transmission system resilience using an automation controller and Distributed Resources," **Resilience Week 2016**. Chicago IL, August 2017

K. Eshghi, B.K. Johnson, C.G. Rieger, "Metrics Required for Power System Resilient Operations and Protection," **Resilience Week, 2016**. Chicago IL, August 2017

SUBMITTED

Mohammad Ashrafuzzaman, Venkata Sreekrishna Koganti, Daniel Conte de Leon, and Frederick T. Sheldon, "*Conceptual Design of an ICS Test-bed for Full Life-Cycle Cyber Security Management*." Submitted to: **8th ACM/IEEE International Conference on Cyber-Physical Systems**.

IN PREPARATION

"Ananth A. Jillepali, Daniel Conte de Leon, Michael Haney and F. T. Sheldon, "A Computational Model for Risk Assessment and Security Management of Cyber Physical Control Systems Using NIST SP 800-80r2," Submitting to: INFOCOM 2017 (6th IEEE Ann. Int'l Workshop on Mission-Oriented Wireless Sensor and Cyber-Physical System Networking (MiSeNet 2017)).

Michael Haney, "DUKPT+AES: A Key Management Scheme with Application to Large Data Sets".

Michael Haney, "Encrypted PCAP for Preserving Privacy in Network Surveillance".

Michael Haney, "CPS Honeypots with IMUNES and Sebek".

Nagarjuna Nuthalapati and Michael Haney, "Taxonomy of Attacks in WAMS (Wide-Area Measurement Systems).

James Peters and Michael Haney, "Survey of Password Mnemonics for Meeting Complexity Requirements".

Ryan Hruska and Michael Haney, "Security Data Analysis with SciDB".

III.3.C Presentations

Title: Electric Grid Modernization and Substation Automation

Day & Time: November 16, 2016 at 2:30 PM presentation and 3:30 social event.

Place: Vandal Ballroom, Bruce M. Pitman Center, University of Idaho.

Co-sponsored by the IEEE Palouse Section and the University of Idaho.

Speaker: John D. McDonald, P.E., IEEE Fellow and Smart Grid Business Development Leader, North America, General Electric (GE) Energy Connections, Grid Solutions

The purpose of this talk is to familiarize participants with a vision for the future of substation automation, within the context of grid modernization.

(4) Strengthen and expand the workforce

In our proposal we stated that accomplishments in this Objective would not occur in the first year. However, our team has already made some progress, namely:

Sheldon and Stauffer made four trips to the Coeur d' Alene area to talk with industry partners and conducted an Industry Stakeholder Summit on September 11th regarding opportunities for improving the talent pipeline with Computer Science and Engineering graduates. We discussed plans for increasing computer science graduates--including expertise in cyber security--and on establishing cooperative internships in the area. A list of organizations visited is included in Appendix B.

Sheldon was an invited Speaker for the IEEE Computer Society Technical Lecture 2016, IEEE Region 6 (Palouse Section), "Quantifying the Impact of Unavailability in Cyber-Physical Environments" October 31, 2016.

V. Description of Future Project Plans

Plans for the future are to accomplish the deliverables of the four objectives. Specifically for the second half of year one we plan to:

- Complete the hires of listed in III.1.A above.
- Complete the video technology enhancements in Idaho Falls described in III.1.C above.
- Begin the enhancements to the Power Systems Laboratory and RADCL. The extent of the enhancements will depend on the success of the proposal to the Murdock Foundation
- Host the Cybersecurity Symposium 2017, April 17-19 in Coeur d' Alene, organized by the University of Idaho and sponsored by the Center for Secure and Dependable Systems in the College of Engineering.
- Participate in the National Cyber Security Summit in Huntsville Alabama June 6-8.

Appendix A

Agendas

**University of Idaho/College of Engineering
Boise State University
Location: City Center Plaza
Joint Meeting
Tuesday, September 27, 2016
Agenda**

- 10:30am Introduction of the University of Idaho Team
- 10:45am Review Location of the Video Conferencing at BSU
- Brainstorming UI/BSU's focus on their security lab
 - UI planned additions to enhance power lab
 - Establish strategic focus (e.g. food processing/agricultural asset protection)
- 11:45am Break for Lunch – at downtown location tbd
- 1:00pm Overview of Current Facilities at UI/INL/BSU
- How can UI/BSU collaborate toward leveraging INL facilities and expertise?
- 1:45pm UI/BSU Collaborations
- Brainstorm Ideas for Joint Projects
- 2:30pm Adjourn

Attendees

BSU

Amy Moll—Dean
Tim Andersen -- Chair, CS
John Stubben -- Research Faculty, ECE
Hoda Mehrpouyan -- Asst. Professor CS
Rex Oxford -- Asst. Dean, COEN
Ben Petersen, IT Systems Engineer

UI

Larry Stauffer – Dean
Rick Sheldon – Chair, CS
Yacine Chakhchoukh, Asst. Professor, ECE
Brian Johnson – Professor, ECE
Barry Willis – Assoc Dean Outreach

University of Idaho (UI) Visit September 28, 2016

UI Participants:

Larry Stauffer, Dean of the College of Engineering, Professor, and Professional Engineer Frederick Sheldon, Professor and Chair of Computer Science
 Barry Willis, Professor and Associate Dean for Outreach
 Brian Johnson, Professor, Electrical and Computer Engineering
 Michael Haney, Assistant Professor, Computer Science

INL Participants:

Brent Stacey, Associate Laboratory Director, National & Homeland Security Dan Elmore, Director, Critical Infrastructure Protection
 Wayne Austad, Director, Cybercore Integration Center
 Joseph Price, Deputy Director, Critical Infrastructure Protection
 Michelle Bingham, Manager, University Partnership & Education Outreach
 Craig Rieger, Principal Control Systems Research Engineer

Host: Joseph Price, 208 932-5370 (cell) or 208 526-6004
 Meeting Coordinator: Julie Irving, 208 526-8722

Willow Creek Building (WCB), 1955 Fremont Ave. Idaho Falls, ID

07:45 a.m. Guest Badging
 WCB Lobby..... Julie Irving

Energy Innovation Laboratory (EIL), Room A110, 775 University Blvd. Idaho Falls, ID

8:00 a.m. Welcome and Introductions Dan Elmore
 8:15 a.m. Objective Overview and Desired Outcomes Brent Stacey and Larry Stauffer
 8:30 a.m. Idaho Global Entrepreneurial Mission (IGEM) Program Overview and Path
 Forward..... University of Idaho
 9:10 a.m. CyberCore Wayne Austad

9:50 a.m. Break

10:10 a.m. UI/INL MOU Update..... Joseph Price
 11:00 a.m. Curriculum Overview: UI & Idaho Falls Extension.. Michael Haney
 11:40 a.m. Working Lunch..... EIL, Room A110
 12:45 p.m. Meetings Conclude/Wrap-up Joseph Price

Critical Infrastructure, Protection & Resilience Building (UB4), 684 University Blvd. Idaho Falls, ID

1:00 p.m. (Optional) Tour of UB4 Joseph Price
 1:30 p.m. (Optional) Follow on Discussion UI and INL

Agenda
November 10, 2016
BSU visit to UI regarding cybersecurity

9:00 Tour of college facilities with BSU

9:30 Introductions and Recap

10:00 Tour Power Systems Lab

10:45 Tour RADICL Lab

11:30 Working lunch: next steps

1:15 Adjourn

Attendees

BSU

Tim Andersen -- Chair, CS

John Stubben -- Research Faculty, ECE

Hoda Mehrpouyan -- Asst. Professor CS

John Gardner -- Professor MBE and Director CAES Energy Efficiency Research Institute

Rex Oxford -- Asst. Dean, COEN

Ben Petersen, IT Systems Engineer

UI

Larry Stauffer – Dean

Rick Sheldon – Chair, CS

Daniel Conte de Leon, Asst. Professor, CS

Yacine Chakhchoukh, Asst. Professor, ECE

Brian Johnson – Professor, ECE

Ray Anderson – IT Manager

Barry Willis – Assoc Dean Outreach

Appendix B
List of Organizations Visited in Northern Idaho

14 Four Inc.	Hagadone Digital	Parkwood Business Properties
Avista Corporation	Idaho National Laboratories	Percussionaire
Ednetics	Idaho Technology Council	Perfution
Empire Airlines	Innovation Collective	Protellget
Empire Unmanned	Intermax Networks	Rohinni
Extratech	ltron	Salesforce
F5	JUB Engineers	Tedder industries
Farb Guidance Systems	Kochava	Triple E Technologies
Fatbeam	Kootenai Health	Xcraft
Frontier Communications	Litehouse Inc.	