Program Proposal for the

Center for Information Assurance Engineering (CIAE)

Submitted by

University of South Carolina, Columbia

on

August 22, 2005

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Andrew A. Sorensen, President
University of South Carolina

CLASSIFICATION

New Center Proposal: Center for Information Assurance Engineering

Academic Units Involved: Department of Computer Science and Engineering
University of South Carolina

Designation: Center for Information Assurance Engineering

Proposed date of Implementation: November 15, 2005

CIP Code: Not Applicable

Proposal to Create the Center for Information Assurance Engineering

JUSTIFICATION

During the last decade the Information Technology (IT) infrastructure of the United States of America has changed dramatically. Interconnected computer networks supporting pervasive computing are widely used in everyday applications. IT has become a fundamental component of civilian, government, and military applications. As our nation's dependency on IT services increases, so does our vulnerability to cyber attacks. **Information assurance is a critical component of homeland security**. To achieve information assurance (IA), we need to develop basic **research**, **educational programs**, and **partnerships** between educational institutes, cyber defense agencies and industry.

The Department of Computer Science and Engineering (CSE) has established IA curriculum (with the support the National Science Foundation) and strong, federally funded research programs. The **Information Security Laboratory** (ISL) (www.cse.sc.edu/research/isl), established in 2001, functions as a research and an educational facility and provides a forum for CSE faculty and students.

Research output of ISL, in terms of funding, publication, and M.S. and Ph.D. enrollment, has been increasing steadily. Since its establishment in 2001, ISL is self-supporting. External research funds, obtained by ISL members, cover student salaries and tuition, faculty support, computers, and operational cost.

One of the activities facilitated by ISL is building **partnerships** with local governmental and industrial companies. ISL established connections with *South Carolina Law Enforcement Division* (SLED), Columbia, SC; *United States Secret Service*, Columbia Field Office, Columbia, SC; *Federal Bureau of Investigations*, Columbia, SC; *Space and Naval Warfare* (SPAWAR) Systems, Charleston, SC; *and Information Systems Security Association* (ISSA), Columbia Chapter, SC.

ISL members actively participate in national and international IA research activities by publishing research papers, participating in program committees, and collaborating with external partners. Currently two full-time faculty members have primary research interests in the field of IA; six

others conduct research in related fields. Since 2000, on average 90-100 undergraduate and graduate students enrolled in IA courses offered by the Department of Computer Science and Engineering.

The Department of Computer Science and Engineering (CSE) offers a **Graduate Certificate Program in Information Assurance and Security** (IA&S). IA&S courses have been evaluated by the *Committee on National Security Systems* (CNSS) and the *National Security Agency* (NSA) and have been certified to meet the National Training Standard for Information Systems Security Professionals, NSTISSI No. 4011, 4013 and 4014-Advanced.

The proposed **Center for Information Assurance Engineering** will broaden the current ISL activities to support the synergistic activities in teaching, research, and collaboration. CIAE will aid the establishment of formal relationship with external partners, application for funding opportunities that are currently not accessible to USC, recruitment of enrollment of new and outstanding students, and gain recognition for USC in IA. Similar to ISL, the proposed CIAE will be self-supporting.

STATEMENT OF PURPOSE OF THE CENTER

The proposed Center for Information Assurance Engineering (CIAE) will provide a **forum** for information assurance (IA) researchers, educators, and professionals. CIAE will act as a **facilitator** for developing partnerships between educational institutes and industrial, government, and defense organizations. Such partnerships will have an impact on the existing IA curriculum at USC, research productivity, and help to establish the role of the University of South Carolina as a leading **educational and research** institute for Information Assurance. Further, enabling collaboration between the different agencies will strengthen the IA infrastructure of the state of South Carolina, and the whole United States of America in general, and thus play a significant role in homeland security.

Currently, there is **no center similar to the proposed CIAE in the state of South Carolina**. Based on the central location of Columbia and the ongoing USC activities in IA the proposed center would be ideally suited to oversee and guide IA efforts in the entire state. Our aim is to increase gradually the number of participating members by targeting different disciplines, like Geographic Information Systems, Criminology and Criminal Justice, Sociology, etc., and deliver our programs to geographically distant areas of South Carolina.

Existence of such a center is also a *mandatory* requirement for the University of South Carolina to become a **Center of Academic Excellence in Information Assurance and Education** (CAEIAE), designated by the National Security Agency. CAEIAE designated institutes receive formal recognition from the United States government, prestige and opportunity for publicity http://www.nsa.gov/isso/programs/coeiae/index.htm), and the ability to enroll government workers as graduate students. In addition, several federal funding opportunities *require* CAEIAE designation as a prerequisite from the applying institute, thus limiting the number of qualified institutes.

STATEMENT OF OBJECTIVES OF THE CENTER

- Provide high quality educational programs for undergraduate and graduate students and for professionals working in IA related areas.
- Develop educational partnership with SC higher educational institutes.
- Increase B.S., M.S. and Ph.D. student enrollment via educational partnerships and distant education.

- Increase funding support for IA research and development by developing interdisciplinary research. Apply research findings to targeted commercial and homeland security areas.
- Collaborate with external partners to develop civilian and defense research and development directions and plans.
- Increase IA awareness of general public by organizing seminars at USC and to give seminars at other institutes and organizations.

SHORT-TERM GOALS OF CIAE

- Develop partnerships between USC academic units, local government, industry, and other higher educational institutes.
- Provide leadership for IA education.
- Develop collaborative research between partner institutes.
- Raise IA awareness by conducting seminars.

LONG-TERM GOALS OF CIAE

- Develop state-wide IA curriculum and educational programs.
- Obtain sponsors for CIAE activities (e.g., donations, student support, etc.).
- Increase student and faculty involvement, including partner educational institutes.
- Develop IA infrastructure building on top of existing solutions, e.g., emergency handling, IA support line, etc.

ACADEMIC INSTITUTES

USC has several activities related to IA in which CSE faculty and students actively participate. *USC Computer Services* organizes a security forum for system administrators to discuss technical, legal, and ethical issues regarding the usage of USC computing resources. They also provide technical support and tools for students, faculty, and staff to secure computing resources. CIAE will support the transfer of research achievements to enhance the security of the USC IT infrastructure.

CIAE will facilitate collaborations with additional academic units that perform IA related research and education. These units include the *Moore School of Business*, Departments of Criminology and Criminal Justice, and Political Science of the *College of Arts and Sciences*, *College of Mass Communications and Information Studies*, etc. Our aim is to gradually involve faculty members of these units in the activities of CIAE.

Finally, the CSE department is extending our IA curriculum by offering IA courses via APOGEE, a distance educational program, enabling students at geographically distant areas to enroll in our programs. The department is offering CSCE 522, Information Security Principles as an APOGEE course for Fall 2005. In addition to the local students, the course has attracted six APOGEE students. CIAE will provide the forum for faculty and administration of other higher educational institutes of the state of South Carolina to support each other by jointly offering IA courses, discuss related issues, and to create new, joint curriculum.

EXTERNAL PARTNERS

Faculty and students of the CSE department have several years of collaboration with the cyber crime unit of the *South Carolina Law Enforcement Division* and the *U.S. Secret Service Columbia Field Office*. Several potential students from *Space and Naval Warfare* (SPAWAR) Systems, Charleston, expressed their interest at our program at M.S. and Ph.D. level. Collaborative

research with SPAWAR employees will increase potential funding for USC researchers. Finally, the CSE faculty and students actively participate at the meetings of the newly formed local chapter of the *Information Systems Security Association* (ISSA). The majority of the participants at the ISSA are industrial IT experts with specific needs and capabilities.

CIAE will provide the common forum for IA experts operating in diverse environments. Existence of such a forum is crucial to effectively target cyber security. The success of the Center will be measured in the synergistic activities among the members, research, educational, and developmental achievements. Some of the criteria will be publications of the members, student involvement, funding, and tools developed.

NATIONALLY RECOGNIZED IA EXPERTS

1. **Dorothy Denning**, Dept. of Defense Analysis at the Naval Postgraduate School
   831-656-3105, dedenning@nps.edu
2. **Sushil Jajodia**, George Mason University, CSIS
   703-993-1653, jajodia@gmu.edu
3. **Eugene Spafford**, Purdue University, CERIAS
   765-494-7825 , spaf@cerias.purdue.edu
4. **Mikhail Atallah**, Purdue University, Dept. of Computer Sciences
   765-494-6017, mja@cerias.purdue.edu
5. **Ravi Sandhu**, George Mason University, Dept. of Information and Software Engr.
   703-993-1659,.sandhu@gmu.edu
6. **Bharat Bhargava**, Purdue University, Dept. of Computer Sciences
   765-494-6013 , http://www.cs.purdue.edu/homes/bb
7. **George Dinolt**, Computer Science Department**,** Naval Postgraduate School
   831-656-3889, gwdinolt@nps.navy.mil
8. **Cynthia Irvine**, Computer Science Department**,** Naval Postgraduate School
   831-656-2461, irvine@nps.navy.mil
9. **Corey Schou**, Idaho State University, College of Business
   208-282-3194, schocore@isu.edu
10. **Jim Alves-Foss**, Center for Secure and Dependable Systems University of Idaho
    208-885-5196, jimaf@uidaho.edu

ORGANIZATIONAL/GOVERNANCE STRUCTURE

The proposed director of CIAE is Dr. Csilla Farkas. CIAE directly reports to the Chair of the Department of Computer Science and Engineering. All obtained funding will be maintained according to USC regulations and under the supervision of the principal investigator. Donations and funding obtained for CIAE, including funds to support administration, research, and educational supports, as well as travel and infrastructure development funds will be maintained according to USC regulations and under the supervision of the PI or the director of the CIAE.

PARTICIPATING MEMBERS

All participants of the proposed CIAE are faculty members of the Department of Computer Science and Engineering, USC, Columbia: **Duncan A. Buell, Caroline M. Eastman, Csilla Farkas, Stephen A. Fenner, Chin-Tser Huang, Michael N. Huhns, Manton Matthews, and Marco Valtorta**.

All CIAE participants will contribute to IA research and education, and seek funding to support these activities. In addition, as the Undergraduate Director of the CSE Department, *Dr. Eastman* is responsible to coordinate curricular activities within USC and in collaborations between USC and other institutes. *Dr. Matthews*, Graduate Direction of the CSE Department, will coordinate curricular activities at the graduate level within USC and in collaborations between USC and other institutes. In addition Dr. Matthews handles admissions to the IA&S Graduate Certificate Program. *Dr. Farkas*, as the Director of the proposed CIAE, will report the Chair of the CSE Department.

PHYSICAL PLANT, EQUIPMENT, LIBRARY RESOURCES

Short term activities of the CIAE do not require any new facilities, equipments, or library resources. Success of the center will be measured in the number of IA graduates, research productivity, and number of partnering institutions. To satisfactorily fulfill our long term goal, access to university resources, like seminar rooms, computer labs, may be required. Additional funding for outreach activities, e.g., giving seminars or inviting speakers, and administrative support might be necessary. We are planning to cover these expenses from obtained grant proposal and increased tuition revenues.

NEW COSTS TO ESTABLISH CENTER OR INSTITUTE

NO FUNDING REQUESTED

We do not request any state funding for CIAE. Current activities require minimal cost that is covered by external research grants. As the activities of the center increases, we are planning to obtain funding from federal funding sources, such as NSF Cyber Trust program and Department of Homeland Security, and from local industry. The existence of CIAE would help in securing such external grants. Low level functionality of CIAE can be maintained indefinitely.

APPENDIX

Biographies of Participating Members:

- DuncanA. Buell
- Caroline M. Eastman
- Csilla Farkas
- Stephen A. Fenner
- Chin-Tser Huang
- Michael N. Huhns
- Manton Matthews
- Marco Valtorta

Biographical Sketch for Duncan A. Buell

Department of Computer Science and Engineering, University of South Carolina, Columbia, South Carolina 29208, buell@sc.edu, 803-777-7356

Education:

Ph. D. in mathematics (number theory), 1976, University of Illinois—Chicago.
M. A. in mathematics, 1972, University of Michigan, Ann Arbor.
B. S. in mathematics, 1971, University of Arizona, Tucson.

Experience:

August 2005-present: Interim Dean, College of Engineering and Information Technology, University of South Carolina, Columbia, SC 29208.
October 2000-present: Professor and Chair, Department of Computer Science and Engineering, University of South Carolina, Columbia, SC 29208
January 1986-September 2000: Center for Computing Sciences, Institute for Defense Analyses, 17100 Science Drive, Bowie, MD 20715
1979-December 1985: Department of Computer Science, Louisiana State University, Baton Rouge, LA 70803
1977-1979:Assistant Professor, Department of Computer Science, Bowling Green State University, Bowling Green, OH 43402
1976-1977:Research Associate, Department of Mathematics, Carleton University, Ottawa, Ontario, Canada K1S 5B6

Relevant Publications:

D. A. Buell, J. P. Davis, and G. Quan, “The DARPA Boolean equation benchmark on a reconfigurable computer,” *Proceedings*, MAPLD 2004: Military and Aerospace Applications of Programmable Logic Devices, Washington, DC, September 2004.
D. Buell, J. Davis, G. Quan, S. Akella, S. Devarkal, P. Kancharla, E. Michalski, and H. Wake, “Experiences with a reconfigurable computer,” *Proceedings*, ERSA-04: International Conference on the Engineering of Reconfigurable Systems and Algorithms, Las Vegas, NV, June 2004.
D. A. Buell, S. Devarkal, and H. A. Wake, "Reconfigurable computing machines and their applications in computational number theory," *Fields Institute Communications: High Primes and Misdemeanours: A Conference in Honor of Hugh Williams*, volume 41, pp. 123-148, Fields Institute, Toronto, 2004.
P. Kancharla and D. A. Buell, "The Advanced Encryption Standard on the HC-36m reconfigurable computer," *Proceedings*, Military Applications of Programmable Logic Devices (MAPLD),Washington, DC, 9-11 September 2003.
D. A. Buell, J. M. Arnold, and W. J. Kleinfelder, eds., *Splash 2: FPGAs in a Custom Computing Machine*, IEEE Computer Society Press, 1996, 320 pages, ISBN 0-8186-7413-X.

Other Publications:

X. Feng, D. A. Buell, J. R. Rose, and P. B. Waddell, "Parallel algorithms for Bayesian phylogenetic inference," *Journal of Parallel and Distributed Computing*, v. 63, pp. 707-718, 2003.

S. Akella, H. A. Wake, J. P. Davis, and D. A. Buell, "Porting EDIF netlists to the Viva environment for integrated custom computing applications," *Proceedings*, MAPLD 2003: Military and Aerospace Applications of Programmable Logic Devices, Washington, DC, September 2003.

G. Quan, D. A. Buell, J. P. Davis, and S. Devarkal, "Design exploration of 192-bit elliptic curve adder on the Star Bridge HC-36 system," *Proceedings*, MAPLD 2003: Military and Aerospace Applications of Programmable Logic Devices, Washington, DC, September 2003.

D. A. Buell, J. P. Davis, and G. Quan, "Reconfigurable computing applied to problems in communications security," *Proceedings*, MAPLD 2002: Military and Aerospace Applications of Programmable Logic Devices, Laurel, Maryland, September 2002.

U. S. Patent number 4,748,585, "Processor utilizing reconfigurable process segments to accommodate data word length," held jointly with Donald M. Chiarulli and Walter G. Rudd.

Synergistic Activities:

Dr. Buell has been active for many years in programs to encourage underrepresented minorities in science and engineering. His Honors College student, Heather Wake, an African-American undergraduate student, was CRA Outstanding Undergraduate Woman runner-up in 2003-2004 and received an NSF Graduate Fellowship, among other fellowships, to attend Duke University. He supervised a research student in parallel computing in the summer of 2001 under the South Carolina Alliance for Minority Participation and received an Outstanding Research Mentor award. He served as a mentor some years ago for and continued to advise John Haskins, an African American from the District of Columbia, who received his doctorate in computer science in December 2002 at the University of Virginia. He follows the advice of Richard Tapia of Rice University: "You don't ask the good students whether they are going to graduate school; you tell them they are going."

Dr. Buell has also been instrumental in furthering the development of reconfigurable computing. He was one of the original organizers in 1993 of the now-annual FCCM (Field Programmable Custom Computing Machines) conference and continues to serve on the review committee.

Collaborators last 48 months: S. Berger, K. Cameron, J. Bowles, J. Davis, C. Eastman, C. Farkas, S. Fenner, J. Johnson, T. Kubota, M. Matthews, L. Pirisi-Creek, G. Quan, J. Rose, L. Szekely, P. Waddell, S. Wang, J. Zachary (faculty at U of South Carolina), S. Akella, A. J. Alon, V. Burle, S. Devarkal, X. Feng, P. Kancharla, E. A. Michalski, R. Mudiyala, S. Ragunathan, N. Sontineni, H. Wake, R. Wilkinson, F. Yue (students at U of South Carolina), G. Call (Amherst), K. Gaj (George Mason University), T. El-Ghazawy (George Washington University), M. George (MUSC), D. Ramsey (SCRA).

Thesis Advisor: A. O. L. Atkin, retired, University of Illinois, Chicago.

Students supervised: Currently supervising C. Cathey, L. Cordova, X. Feng, A. Michalski, C. Zhang (Ph.D.) and co-supervising S. Akella (Ph.D.)

Biographical Sketch for Caroline M. Eastman

1. **Degrees with Fields, Institution, and Date:**

AB	Applied Mathematics	Radcliffe College	1968
MS	Computer Science	University of North Carolina	1974
Ph.D.	Computer Science	University of North Carolina	1977

2. **Service at the University of South Carolina:** 19 years service, 1986 – present

Professor	1991 - present
Associate Professor	1986 – 1991

3. **Other Related Experience (teaching, industrial, etc.):**
   Assistant Professor, Florida State University, 1977-1982
   Assistant Professor, Southern Methodist University, 1982-84
   Associate Professor, Southern Methodist University, 1984-1985 (on leave)
   Program Director, National Science Foundation, 1984-1985
4. **Consulting, Patents, etc.:** NASA Johnson Space Center (summer 1979); Rome Air Development Center (summer 1980); Army Corps of Engineers Waterways Experiment Station (summer 1992).
5. **States in which registered:** none
6. **Principal Publications: (2001 – 2004)**
   - Csilla Farkas, Tyrone S. Toland, and Caroline M. Eastman, "The inference problem and updates in relational databases," *Proceedings of the Fifteenth Annual IFIP WG 11.3 Working Conference on Database and Applications Security*, Niagara on the Lake, Ontario, Canada, July 15-18, 2001, pp. 171-186.
   - Sahadeb De, Caroline M. Eastman, and Csilla Farkas, "Secure access control in a multi-user geodatabases," *Proceedings of the 2002 ESRI User Conference*. CS-ROM and Web publication. http://www.esri.com/library/userconf/proc02/pap0355/p0355.htm
   - Nancy J. Lightner and Caroline M. Eastman, "User preference for product information in remote purchase environments." *Journal of Electronic Commerce Research*, August 2002, Vol. 3, No. 3, pp. 174-186. http://www.csulb.edu/web/journals/jecr/issues/20023/paper6.pdf
   - Caroline M. Eastman, "30,000 hits may be better than 300: Precision anomalies in Internet searches." *Journal of the American Society for Information Science and Technology*, September 2002, Vol. 53, No. 11, pp. 879-882.
   - J. Gregory Dobbins and Caroline M. Eastman, "Using real cases in an introductory database management course," *Proceedings of the ASEE Southeast Section Annual Conference*, April 6-8, 2003, Macon, Georgia. CD-ROM and online publication. http://cee.citadel.edu/asee-se/proceedings/ASEE2003/ASEE2003SE.htm
   - Caroline M. Eastman and Csilla Farkas, "Information systems security: Distributed modules or centralized course," *Proceedings of the ASEE Southeast Section Annual Conference*, April 6-8, 2003, Macon, Georgia. CD-ROM and online publication. http://cee.citadel.edu/asee-se/proceedings/ASEE2003/ASEE2003SE.htm
   - Bernard J. Jansen and Caroline M. Eastman, "The effects of search engines and query operators on top ranked results," *Proceedings of the IEEE 4th International Conference on Information Technology, Coding and Computing*, Las Vegas, Nevada, April 28-30, pp. 135-139.
   - Susan G. Doran, Caroline M. Eastman, and Bernard J. Jansen, "Nutritional information on the Web: An analysis of information sought and information provided," *Proceedings of the 2003 IRMA International Conference*, Philadelphia, Pennsylvania, May 18-21, 2003, pp. 106-108.
   - Caroline M. Eastman and Csilla Farkas, "Information systems security in the information

systems curriculum, *Proceedings of the 2003 IRMA International Conference*, Philadelphia, Pennsylvania, May 18-21, 2003, pp. 117-118.

- Bernard J. Jansen and Caroline M. Eastman, "The effects of search engines and query operators on top ranked results," *Proceedings of IEEE ITCC 2003: 4th International Conference on Information Technology: Coding and Computing*, Las Vegas, Nevada, 28-30 April 2003, pp. 135-139.
- Caroline M. Eastman and Bernard J. Jansen, "Coverage, relevance, and ranking: The impact of query operators on Web search engine results," *ACM Transactions on Information Systems*, October 2003, Vol. 21, No 4, pp. 383-411.
- John B. Bowles and Caroline M. Eastman, "Model Driven Development: Implementing a New Software Development Paradigm in a Capstone Software Engineering Course," *Proceedings of the ASEE Southeast Section Annual Conference*, Auburn, Alabama, April 4-6, 2004, CD.
- Caroline M. Eastman and Bernard J. Jansen, "The appropriate (and inappropriate) use of query operators and their effect on Web search results," to appear in the *Proceedings of the Annual Meeting of the American Society for Information Science and Technology,* 2004, Providence, Rhode Island, November 13-18, 2004.

7. Principal Research Grants (2000 – 2004)

- NSF, Information Systems Security Education at USC, 9/2001-8/2003, $199,846
- NSF, REU Site: Multidisciplinary Research in Computing, 4/2004—3/2004, $224,835

8. Scientific and Professional Societies Memberships:

American Association for the Advancement of Science; Association for Computing Machinery; Association for Women in Science; American Society for Information Science; Computer Society of the Institute for Electrical and Electronics Engineers; Society of Women Engineers

9. Honors and Awards:

Phi Beta Kappa, Sigma Xi, Upsilon Pi Epsilon
USC COEIT Joseph M. Biedenbach Distinguished Service Award, 2002
Outstanding Research Mentor, SCAMP, 2002
USC Samuel Litman Distinguished Professor Award, 2003

10. Institutional and Professional Service (last 5 years):

Institutional Service:

Director of Undergraduate Studies, Department of Computer Science [and Engineering], 1999-present.
Departmental Library Representative, 1986-present.
University Faculty Budget Committee, 1998-2001
University Faculty Welfare Committee, 1997-2000 (Chair, 1998-2000)
Numerous other departmental, college, and university committees.

Professional:

South Carolina Chapter of the Association for Women in Science, President 1996-1997,
Region II Science Fair Coordinator, 1997 – present.
National Science Foundation, evaluation panels.
Faculty Advisor, USC SWE Chapter, 2004 – present.

11. Professional Development Activities (last 5 years):

Compuware OptimalJ training, July 2003.
USC training on library materials.
Regular attendance at professional conferences.

Biographical Sketch for Csilla Farkas

Education

- **Ph.D**., Information Technology, George Mason University, Fairfax, VA, 1995-2000
- **M.S**., Computer Science, George Mason University, Fairfax, VA, 1991-1993
- **B.S**., Computer Science, Institution of Computer Science, Budapest, Hungary, 1986-1989
- **B.S**., Geology, Eötvös Loránd University, Budapest, Hungary, 1980-1985

Employment

- **Assistant Professor**, Department of Computer Science and Engineering, University of South Carolina, Columbia, South Carolina, 2000-Present
- **Research Assistant**, Department of Information and Software Engineering, George Mason University, Fairfax, Virginia 1996-2000
- **Teaching Assistant**, Department of Computer Science, George Mason University, Fairfax, Virginia, 1995-1996
- **Geologist and Computer Scientist**, Hungarian Oil and Gas Trust, Budapest, Hungary, 1987-1989
- **Computer Scientist**, River Exploration Company, Budapest, Hungary, 1985-1987

Honors

- National Science Foundation Career Award, 2003-2008
- IT&E Doctoral Fellowship Award, GMU, VA, 1996-1997, 1998, 1999
- Computer Science Graduate Honor Roll Award, GMU, VA, 1994

Principal Research Grants: (2000 – 2005)

- **PI: C. Farkas**, "CAREER: Semantic Web: Interoperation vs. Security – A New Paradigm of Confidentiality Threats," NSF- CAREER, $400,000, 9/1/03—8/31/08 – awarded
- **PI: C.Farkas**, "Anonymous Accountable Self-Organizing Cooperation," NSF Research Initiating grant, $18,523, 9/1/03—8/31/08 – awarded
- **PI: C. Farkas** , Duncan Buell, Caroline Eastman, Stephen Fenner, Joseph Johnson, "Information Systems Security Education at the University of South Carolina," NSF, $199,846, 9/1/01-8/31/03. – extended to 8/31/04 – awarded
- **Participating Mentor: C. Farkas** in: PI: C. Eastman, "REU Site: Multidisciplinary Research in Computing Sponsor," NSF, $224,835 – awarded
- PI: R. Dougal, **Co-PI: C. Farkas**, "USC's Participation in Electric Ship R&D Consortium, ONR Long Range Science and Technology Program 2002- 2006," ONR, – C. Farkas' share is 0.5-1 month summer support and support of 1 RA (about 35,000) – administered by the EE Dept., 2002-2006. – awarded

Relevant Publications:

- C. Eastman and **C. Farkas**, "Information Systems Security in the Information Systems Curriculum," *IRMA International Conference*, Philadelphia, 2004
- **C. Farkas** and A. Stoica, "Correlated Data Inference in Ontology Guided XML Security Engine," *IFIP 17th WG 11.3 working conference on Data and Application Security*, 2003
- **C. Farkas** and S. Jajodia, "The Inference Problem: A Survey," *SIGKDD Explorations*, Special Issue on Privacy and Security, December 2002 Vol. 4/2, pages 6-12.
- **C. Farkas** and M. Huhns, "Making Agents Secure on the Semantic Web," *IEEE Internet Computing*, Nov-Dec 2002, pages 76-79

- Brodsky, **C. Farkas**, S. Jajodia, "Secure Databases: Constraints, Inference Channels and Monitoring Disclosures," *IEEE Trans. on Knowledge and Data Engineering*, 12(6):900-919, November/December 2000

Other Publications:

- N. Kodali, **C. Farkas**, D. Wijesekera, "Enforcing Integrity in Multimedia Surveillance," IFIP *6th WG 11.5, Working Conference on Data Integrity and Control in Information Systems*, 2003
- **C. Farkas**, G. Ziegler, A. Meretei, and A. Lorincz, "Anonymity and Accountability in Self-Organizing Electronic Communities," *In Proc. Workshop on Privacy in the Electronic Society, in association with the 9th ACM CCS Conference*, 2002
- C. Eastman and C. Farkas, "Information Systems Security: Distributed Modules or Centralized Course?," *ASEE Southeast Section Annual Conference*, April 2003
- **C. Farkas**, T. Toland, C. Eastman, "The Inference Problem and Updates in Relational Databases," *In Proc. 15th IFIP WG11.3 Working Conference on Database and Application Security*, Niagara on the Lake, Ontario, Canada, July 15-18, 2001.
- A. Brodsky, **C. Farkas**, D. Wijesekera, S. X. Wang, "Constraints, Inference Channels and Secure Databases," *In Proc. Sixth International Conference on Principles and Practice of Constraint Programming*, pages 98-113, Sept. 2000, Singapore

Synergistic Activities:

- Establish security education curriculum at the University of South Carolina. Director of the Information Security Laboratory (http://www.cse.sc.edu/research/isl).
- Research advisor of graduate and undergraduate students, including undergraduate South Carolina Alliance for Minority Participation students in security research.
- Reviewer for IEEE Transactions on Mobile Computing and Journal of Systems Science and Systems Engineering. Reviewer and member of program committees of national and international conferences and workshops.
- Panelist for several NFS panels.

Collaborations:

- Collaborations during doctoral study: Drs. Brodsky, Jajodia, and Wijesekera – George Mason University, VA
- Current collaborations:
    - Drs. Eastman, Fenner, Valtorta, Vargas, Buell, Huhns, Rose, Kubota, and De – University of South Carolina, SC
    - Drs. Lorincz, Ziegler, Meretei, Eotvos Lorand University and Budapest Technical University, Hungary
- Drs. Jajodia, Wijesekera – George Mason University, VA
- Drs. Hamilton, Chapman, Auburn University, AL
- Ph.D. students Stoica, Gowadia, Talekar, Toland, Kodali – University of South Carolina, SC

Biographical Sketch for Stephen A. Fenner

Biographical Sketch for Chin-Tser Huang

Department of Computer Science & Engineering
University of South Carolina

PROFESSIONAL PREPARATION

- National Taiwan University Computer Science B.Sc., 1993
- University of Texas at Austin Computer Science M.S., 1998
- University of Texas at Austin Computer Science Ph.D., 2003

ACADEMIC/PROFESSIONAL APPOINTMENTS

- Assistant Professor, Department of Computer Science & Engineering, University of South Carolina, Columbia, SC (2003 – present)

PUBLICATIONS

Related Publications

1. M. G. Gouda, E. N. Elnozahy, C.-T. Huang, T. M. McGuire. Hop Integrity in Computer Networks. *IEEE/ACM Transactions on Networking*, Volume 10, Issue 3, June 2002.
2. C.-T. Huang, M. G. Gouda, E. N. Elnozahy. Convergence of IPsec in Presence of Resets. *Proceedings of the 2nd International Workshop on Assurance in Distributed Systems and Networks*, Providence, Rhode Island, May 2003.
3. M. G. Gouda, C.-T. Huang. A Secure Address Resolution Protocol. *Computer Networks*, Vol. 41, No. 1, January 2003.
4. M. G. Gouda, C.-T. Huang, E. N. Elnozahy. Key Trees and the Security of Interval Multicast. *Proceedings of the 22nd IEEE International Conference on Distributed Computing Systems*, Vienna, Austria, July 2002.
5. X. Zheng, C. Chen, C.-T. Huang, M. Matthews, N. Santhapuri. A Dual Authentication Protocol for IEEE 802.11 Wireless LANs. To appear in *Proceedings of the 2nd International Symposium on Wireless Communication Systems*, September 2005.

Other Significant Publications

1. C.-T. Huang, M. G. Gouda. State Checksum and Its Role in System Stabilization. *Proceedings of the Fourth International Workshop on Assurance in Distributed Systems and Networks*, Columbus, Ohio, June 2005.
2. C.-T. Huang, M. G. Gouda. An Anti-Replay Window Protocol with Controlled Shift. *Proceedings of the 10th IEEE International Conference on Computer Communications and Networks*, Scottsdale, October 2001.
3. M. G. Gouda, C.-T. Huang, A. Arora. On the Security and Vulnerability of PING. *Proceedings of the 5th Workshop on Self-stabilizing Systems (WSS)*, Lisbon, Portugal, October 2001.
4. M. G. Gouda, E. N. Elnozahy, C.-T. Huang, T. M. McGuire. Hop Integrity in Computer Networks. *Proceedings of the 8th IEEE International Conference on Network Protocols (ICNP)*, Osaka, Japan, November 2000.

5. M. G. Gouda, C.-T. Huang, E. Li. Anti-Replay Window Protocols for Secure IP. *Proceedings of the 9th IEEE International Conference on Computer Communications and Networks (ICCCN)*, Las Vegas, October 2000.

Book

1. C.-T. Huang, M. G. Gouda. *Hop Integrity: A Defense Against Denial-of-Service Attacks*. To be published by Springer in 2005.

SYNERGISTIC ACTIVITIES

- Developed one course related to network security and one course related to network programming in first year as faculty member at USC.
- Panelist, NSF SBIR/STTR (Phase II), October 2003.
- Editor, Journal of High Speed Networks (2005 – present).
- Program Committee member, Thirteenth International Conference on Network Protocols (ICNP 2005).
- Program Committee member, Fourteenth International Conference on Computer and Communications and Networks (ICCCN 2005).
- Program Committee member, Fourth International Workshop on Assurance in Distributed Systems and Networks (ADSN 2005).
- Member of IEEE, ACM.

COLLABORATORS AND OTHER AFFILIATIONS

Collaborators

- Drs. Duncan Buell, Manton M. Matthews, Caroline Eastman, Csilla Farkas, Srihari Nelakuditi, John Bowles, Yong-June Shin (University of South Carolina)
- Dr. Mohamed G. Gouda (University of Texas at Austin)
- Dr. Min-Te Sun (Auburn University)

Graduate Advisors

- Ph.D. advisor: Dr. Mohamed G. Gouda (University of Texas at Austin)

Advisees

- University of South Carolina, Columbia: Jeff Janies (Ph.D.), Prasanth Kalakota (Ph.D.), Sachin Thareja (MS), Jamie Margaret Huenefeld (MS)

Biographical Sketch for Michael N. Huhns

(i) Professional Preparation			
University of Michigan	Electrical Engineering	B.S.	1969
University of Southern California	Electrical Engineering	M.S.	1971
University of Southern California	Electrical Engineering	Ph.D.	1975

Appointments

1995 to Present: Professor, Department of Computer Science and Engineering, University of South Carolina, Director, Center for Information Technology, University of South Carolina, Columbia, SC

1994 to 1995: Adjunct Professor, Department of Computer Science, University of Texas at Austin

1985 to 1995:
Senior Member of Research Division, Microelectronics and Computer Technology Corporation

1979 to 1985:
Associate Professor, Dept. of Electrical and Computer Engineering, University of South Carolina

1975 to 1979:
Assistant Professor, Dept. of Electrical and Computer Engineering, University of South Carolina

1971 to 1975:
Research Assistant, Image Processing Laboratory, University of Southern California

1969 to 1971:
Radar Systems Engineer, Hughes Aircraft Company

Publications

5 publications most closely related to the proposed project

1. M. N. Huhns, V. T. Holderfield, and R. L. Zavala, "Achieving Software Robustness Via Large-Scale Multiagent Systems," in *Software Engineering for Large-Scale Multi-Agent Systems*, A. Garcia, C. Lucena, F. Zambonelli, A. Omicini, and J. Castro, editors, Springer Verlag, Lecture Notes in Computer Science, vol. 2603, Berlin, pp. 199-215, 2003.
2. L. M. Stephens and A. K. Gangam, and M. N. Huhns "Constructing Consensus Ontologies for the Semantic Web: A Conceptual Approach," *World Wide Web Journal*, Kluwer Academic Publishers, vol. 7, no. 4, pp. 421-442, December 2004.
3. M. N. Huhns, "Consensus Software: Robustness and Social Good," *IEEE Internet Computing*, vol. 7, no. 3, pp. 91-93, May/June 2003.
4. J. R. Rose and M. N. Huhns, "Philosophical Agents," *IEEE Internet Computing*, vol. 5, no. 3, pp. 104-106, May/June 2001.
5. M. N. Huhns, "Interaction-Oriented Programming," in *Agent-Oriented Software Engineering*, Paulo Ciancarini and Michael Wooldridge, editors, Springer Verlag, Lecture Notes in AI, vol. 1957, Berlin, pp. 29-44, 2001.
6. M. P. Singh and M. N. Huhns, "Social Abstractions for Information Agents," in *Intelligent Information Agents*, Matthias Klusch, editor, Kluwer Academic Pub.,

Boston, MA, 1999.

5 other significant publications

1. M. P. Singh and M. N. Huhns, *Service-Oriented Computing: Semantics, Processes, Agents*, John Wiley & Sons Pub. Co., London, UK, 2005.
2. R. L. Zavala and M. N. Huhns, "On Building Robust Web Service-Based Applications," in *Extending Web Services Technologies: The Use of Multi-Agent Approaches*, L. Cavedon, Z. Maamar, D. Martin, and B. Benatallah, Kluwer Academic Publishing, New York, pp. 293-310, 2004.
3. M. N. Huhns and M. P. Singh, (eds.), *Readings in Agents*, Morgan Kaufmann Publishers, Inc., San Francisco, CA, 1997.
4. M. N. Huhns and D. M. Bridgeland, "Multiagent Truth Maintenance," *IEEE Transactions on Systems, Man, and Cybernetics*, vol. 21, no. 6, 1437-1445, December 1991.
5. M. N. Huhns (ed.), *Distributed Artificial Intelligence*, Pitman Publishing Ltd., London, 1987.

Synergistic Activities

1. Dr. Huhns is currently on the editorial boards for seven journals and has served on 16 international program committees within the last year.
2. Dr. Huhns and his former Ph.D. student, Dr. Kuha Mahalingam, have developed the Java Ontology Editor and released it as open-source software. It is being used actively in six research projects world-wide.
3. Dr. Huhns is a co-founder and member of the board of the *International Foundation for Multiagent Systems*.
4. Since 1990 Dr. Huhns has been the moderator of DAI-List, a weekly Internet mailing list with >1000 subscribers devoted to distributed artificial intelligence and multiagent systems.
5. Dr. Huhns is the author of the standard ISO/IEC 11179-2 *Information Technology—Specification and Standardization of Data Elements—Part 2: Classification of Data Elements*.

Collaborators and Other Affiliations

Collaborators within the last 48 months

D. Buell (U. South Carolina), P. Buhler (College of Charleston), K. Decker (U. Delaware), E. Durfee (U. Michigan), R. Emami (GITI), L. Gasser (U. Illinois), H. Ghenniwa (U. Waterloo), J. Heflin (Lehigh U.), J. Hendler (U. Maryland), N. Ivezic (NIST), V. Kashyap (NLM), J. Keele (USDA), V. Lesser (UMASS), M. Papazoglou (U. Tilburg), C. Petrie (Stanford), J. Rose (U. South Carolina), A. Sheth (U. Georgia), M. Singh (NCSU), L. Stephens (U. South Carolina), K. Sycara (CMU), M. Valtorta (U. South Carolina), J. Vidal (U. South Carolina), G. Weiss (U. Munich), M. Wooldridge (U. Liverpool).

Graduate student advisement

Ph.D. Graduates Advised: 5
M.S. Graduates Advised: 80

Post-doctoral advisees

Barcin Kozbe (Ericsson), Martin Kollingbaum (University College, London)

Name of own graduate advisor

William K. Pratt, University of Southern California

Biographical Sketch for Manton M. Matthews

Biographical Sketch for Marco Valtorta

Educational History

Politecnico di Milano (Italy) 1980	Electrical Engineering	"Laurea"
Duke University 1984	Computer Science	M.A.
Duke University 1987	Computer Science	PhD

APPOINTMENTS

1994 – present *Associate Professor*, Dept. of Computer Science and Engineering, Univ. of South Carolina

(Department of Computer Science before expansion and renaming of department in 2000)

1993 - 1999 *Director of Undergraduate Studies*, Dept. of Computer Science, Univ. of South Carolina

1988 - 1994 *Assistant Professor*, Dept. of Computer Science, Univ. of South Carolina

1985 - 1988 *Project Officer*, ESPRIT, Commission of the European Communities, Brussels, Belgium

1980 - 1985 *Research Assistant* for prof. D.W. Loveland, Dept. of Computer Science, Duke Univ.

RELEVANT Publications

1) Farkas, Csilla, Vaibhav Gowadia, and Marco Valtorta. "PAID: A Probabilistic Agent-Based Intrusion Detection System," *Journal of Computers and Security*, in press (2005).

2) Mani, Subramani, M. Valtorta, and Suzanne McDermott, "Building Bayesian Network Models in Medicine: the MENTOR Experience." *Applied Intelligence*, 22, 2 (March/April 2005), 93-108 (2005)

3) Moole, Bhaskara Reddy and Marco Valtorta, "Sequential and Parallel Algorithms for Causal Explanation with Background Knowledge," *International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems*, 12, Supplementary Issue 2 (October 2004), 101-122, 2004

4) Kim, Young-Gyun, M. Valtorta, and Jiri Vomlel, "A Prototypical System for Soft Evidential Update," *Applied Intelligence*, 21, 1 (July-August 2004), 81-97, 2004

5) Valtorta, M., Y.-G. Kim, and J. Vomlel. "Soft Evidential Update for Probabilistic Multiagent Systems." *International Journal of Approximate Reasoning*, 29, 1 (January 2002), 71-106

6) Valtorta, M. and M. Huhns. "Probability and Agents." *IEEE Internet Computing*, 5, 6 (November/December 2001), 77-79

7) Bloemeke, Mark and M. Valtorta. "A Hybrid Algorithm to Compute Marginal and Joint Beliefs in Bayesian Networks and Its Complexity." In: G.F. Cooper and S. Moral (eds.), *Uncertainty in Artificial Intelligence: Proceedings of the Fourteenth Conference*. San Francisco, CA: Morgan-Kaufmann, 1998, 16-23

8) Kim. Y.-G. and M. Valtorta. "On the detection of Conflicts in Diagnostic Bayesian Networks Using Abstraction." In: Ph. Besnard and S. Hanks (eds.), *Uncertainty in Artificial Intelligence: Proceedings of the Eleventh Conference*. San Francisco, CA: Morgan-Kaufmann, 1995, 362-367

9) Singh, Moninder and M. Valtorta. "Construction of Bayesian Belief Networks from Data: a Brief Survey and an Efficient Algorithm." *International Journal of Approximate Reasoning*, 12, 2 (February 1995), 111-131

10) Valtorta, M. and Donald W. Loveland. "On the Complexity of Belief Network Synthesis and Refinement." *International Journal of Approximate Reasoning*, 7, 3-4 (October-November 1992), 121-148

11) Durham, Stephen D., Jeffrey S. Smolka, and M. Valtorta. "Statistical Consistency with Dempster's Rule on Diagnostic Trees Having Uncertain Performance Parameters." *International Journal of Approximate Reasoning*, 6,1 (January 1992), 67-81

SYNERGISTIC ACTIVITIES

Dr Valtorta developed a new course on graphical probabilistic modeling and normative decision support, offered for the first time in Fall 2002: Bayesian Networks and Decision Graphs. The course is cross-listed as a Statistics course (CSCE 582 = STAT 582). Dr. Valtorta has been active in curriculum development since joining the department of Computer Science at the Univ. of South Carolina. He was a Lilly teaching fellow in 1993-94, director of undergraduate studies from 1993 to 1999, advisor of the year for the College of Science and Mathematics in 1997, and spent part of a 1999-2000 sabbatical as guest of the Decision

Support Systems Group in the Department of Computer Science at the University of Aalborg, Denmark, directed by professor Finn V. Jensen.

COLLABORATORS on Papers, projects, etc. within past 48 month:

Name	Institution	Location
Farkas, Csilla	University of South Carolina	Columbia, SC
Huhns, Michael	University of South Carolina	Columbia, SC
Vomlel, Jiří	Academy of Sciences	Prague, Czech Republic
McDermott, Suzanne	Univ. of South Carolina (Medicine)	Columbia, SC
Mani, Subramani	University of Pittsburgh	Pittsburgh, PA
Kim, Young-Gyun	SC State University	Orangeburg, SC
Bloemeke, Mark	Rytek, Inc.	Atlanta, GA

Co-EDITORS:

Dr. Valtorta has been an associate editor of the *International Journal of Approximate Reasoning* since 1993. The other editors are: M. Berthold, J. Bezdek, P.P. Bonissone (co-editor-in-chief), B. D'Ambrosio, T. Denoeux (co-editor-in-chief), D. Filev, L. Hall, R. Jang, J. Keller, H.T. Nguyen, N.R. Pal, W. Pedrycz, M. Roubens, E. Ruspini, P. Shenoy, P. Smets, E. Trillas, I.B. Turksen, J. Yen. Dr. Valtorta is also a member of the large editorial boards of *Applied Intelligence* and of the *International Journal of Applied Management and Technology*.

GRADUATE AND POST-DOCTORAL ADVISORS

"Laurea" Thesis Advisor: Prof. Marco Somalvico – Politecnico di Milano, Milano (Italy) (deceased)
PhD Dissertation Advisor: Prof. Donald W. Loveland – Dept. of Computer Science, Duke University (retired).

THESIS ADVISOR AND POSTGRADUATE-SCHOLAR SPONSOR

PhD Students supervised (3, all at the University of South Carolina)

NAME	Degree	Title	Date
Hibler, David	PhD	The Thought Experiment Method: A New Approach to Qualitative Reasoning	January 1992
Bloemeke, Mark	PhD	Agent Encapsulated Bayesian Networks	August 1998
Kim, Young-Gyun	PhD	Time-Critical Decision Making with Communicating Influence Diagrams	December 2000

Current Student Supervision

NAME	YEAR	DEGREE	TITLE
Sessions, Valerie	2006	PhD	Incorporating Data Set Quality Assessments into Learning Algorithms for Bayesian Networks
Yimin Huang	2006	PhD	TBD (in the area of causal Bayesian networks)

MS Students supervised (21, all at the University of South Carolina)