Jay Ligatti

Contact Information
University of South Florida CSE
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Research Areas
Software security and programming languages

Appointments
University of South Florida
Associate Professor, Department of Computer Science and Engineering (2012-present)
Assistant Professor, Department of Computer Science and Engineering (2006-2012)

Education
Princeton University (2001-2006)
Degrees: Ph.D., Computer Science (2006); M.A., Computer Science (2003)
Dissertation: *Policy Enforcement via Program Monitoring*
Adviser: David Walker

University of South Carolina (1997-2001)
Degrees: B.S., Computer Science (2001); B.M., Music Composition (2001)
Honors: summa cum laude, Phi Beta Kappa, honors college, piano perf. certificate
Advisers: John Kenneth Adams, Reginald Bain

Awards and Honors
- USF Excellence in Innovation Award, 2017
- ACM Senior Member, 2016
- Test of Time Award at the 2015 ACM *Conference on Computer and Communications Security (CCS)*, for Control-Flow Integrity [22]
    - In 2003, when I had the idea to embed IDs in jump destinations and detect attacks by checking the IDs before jumping, in a technique I called Control-Flow-Integrity (CFI) enforcement, I had no idea how much attention it would receive. My effort on the project related to theory—creating and proving the soundness of the technique. Úlfar Erlingsson, Martín Abadi, and Mihai Budiu deserve all the credit for transitioning this theory to practice, implementing and empirically evaluating the technique, and writing up the descriptions in the original research papers.
    - In June 2016 Intel announced adoption of CFI for future processors.
- USF Outstanding Research Achievement Award, 2009
- NSF Faculty Early Career Development (CAREER) Award, 2008
- Best-paper award at the 2007 ACM *Conference on Programming Language Design and Implementation (PLDI)*, for [20]
- CCS'05 paper [22] was invited to appear as TISSEC journal article [6]
- FCS'02 paper [29] was invited to appear as IJIS journal article [10]

Refereed Journal Publications

[1] On Subtyping-Relation Completeness, with an Application to Iso-Recursive Types. Jay Ligatti, Jeremy Blackburn, and Michael Nachtigal. *ACM Transactions on Programming Languages and Systems (TOPLAS)*. Vol 39, No 1, Article 4, pp 1-36. ACM Press, March 2017.

[2] Design of Adiabatic Dynamic Differential Logic for DPA-Resistant Secure Integrated Circuits. Matthew Morrison, Nagarajan Ranganathan, and Jay Ligatti. *IEEE Transactions on Very Large Scale Integration Systems (TVLSI)*. Vol 23, No 8, pp 1381-1389. IEEE, August 2015.

[3] Modeling Runtime Enforcement with Mandatory Results Automata. Egor Dolzhenko, Jay Ligatti, and Srikar Reddy. *International Journal of Information Security (IJIS)*. Vol 14, No 1, pp 47-60. Springer-Verlag, February 2015.

[4] A Location-based Policy-specification Language for Mobile Devices. Joshua Finnis, Nalin Saigal, Adriana Iamnitchi, and Jay Ligatti. *Pervasive and Mobile Computing (PMC)*. Vol 8, No 3, pp 402-414. Elsevier, June 2012.

[5] PoliSeer: A Tool for Managing Complex Security Policies. Daniel Lomsak and Jay Ligatti. *Journal of Information Processing (JIP)*. Vol 19, pp 292-306. Information Processing Society of Japan, July 2011.

[6] Control-Flow Integrity: Principles, Implementations, and Applications. Martín Abadi, Mihai Budiu, Úlfar Erlingsson, and Jay Ligatti. *ACM Transactions on Information and System Security (TISSEC)*, Vol 13, No 1, Article 4, pp 1-40. ACM Press, October 2009.

[7] Composing Expressive Run-time Security Policies. Lujo Bauer, Jay Ligatti, and David Walker. *ACM Transactions on Software Engineering and Methodology (TOSEM)*, Vol 18, No 3, pp 1-43. ACM Press, May 2009.

[8] Run-Time Enforcement of Nonsafety Properties. Jay Ligatti, Lujo Bauer, and David Walker. *ACM Transactions on Information and System Security (TISSEC)*, Vol 12, No 3, pp 1-41. ACM Press, January 2009.

[9] A Type-theoretic Interpretation of Pointcuts and Advice. Jay Ligatti, David Walker, and Steve Zdancewic. In Pascal Fradet and Ralf Lämmel, editors, *Science of Computer Programming (SCP): Special Issue on Foundations of Aspect-Oriented Programming*, Vol 63, No 3, pp 240-266. Elsevier, December 2006.

[10] Edit Automata: Enforcement Mechanisms for Run-time Security Policies. Jay Ligatti, Lujo Bauer, and David Walker. *International Journal of Information Security (IJIS)*, Vol 4, No 1-2, pp 2-16. Springer-Verlag, February 2005.

Selective Conference Publications

[11] A Theory of Gray Security Policies. Donald Ray and Jay Ligatti. Proceedings of the *European Symposium on Research in Computer Security (ESORICS)*, September 2015.

[12] Defining Injection Attacks. Donald Ray and Jay Ligatti. Proceedings of the *International Information Security Conference (ISC)*, October 2014.

[13] Fingerprinting Far Proximity from Radio Emissions. Tao Wang, Yao Liu, and Jay Ligatti. Proceedings of the *European Symposium on Research in Computer Security (ESORICS)*, September 2014.

[14] Defining Code-injection Attacks. Donald Ray and Jay Ligatti. Proceedings of the ACM SIGPLAN-SIGACT *Symposium on Principles of Programming Languages (POPL)*, January 2012.

[15] A Theory of Runtime Enforcement, with Results. Jay Ligatti and Srikar Reddy. Proceedings of the *European Symposium on Research in Computer Security (ESORICS)*, September 2010.

[16] A Packet-classification Algorithm for Arbitrary Bitmask Rules, with Automatic Time-space Tradeoffs. Jay Ligatti, Josh Kuhn, and Chris Gage. Proceedings of the 19th *IEEE International Conference on Computer Communication Networks (ICCCN)*, August 2010.

[17] PoliSeer: A Tool for Managing Complex Security Policies. Daniel Lomsak and Jay Ligatti. Proceedings of the *International Conference on Trust Management (IFIP-TM)*, June 2010.

[18] Inline Visualization of Concerns. Nalin Saigal and Jay Ligatti. Proceedings of the *ACIS International Conference on Software Engineering Research, Management, and Applications (SERA)*, December 2009.

[19] LoPSiL: A Location-based Policy-specification Language. Jay Ligatti, Billy Rickey, and Nalin Saigal. Proceedings of the *International ICST Conference on Security and Privacy in Mobile Information and Communication Systems (MobiSec)*, June 2009.

[20] Fault-tolerant Typed Assembly Language. Frances Perry, Lester Mackey, George Reis, Jay Ligatti, David August, and David Walker. Proceedings of the ACM SIGPLAN *Conference on Programming Language Design and Implementation (PLDI)*, June 2007.

[21] Static Typing for a Faulty Lambda Calculus. David Walker, Lester Mackey, Jay Ligatti, George Reis, and David August. Proceedings of the ACM SIGPLAN *International Conference on Functional Programming (ICFP)*, September 2006.

[22] Control-Flow Integrity: Principles, Implementations, and Applications. Martín Abadi, Mihai Budiu, Úlfar Erlingsson, and Jay Ligatti. Proceedings of the ACM

SIGSAC *Conference on Computer and Communications Security (CCS)*, November 2005.

[23] A Theory of Secure Control Flow. Martín Abadi, Mihai Budiu, Úlfar Erlingsson, and Jay Ligatti. Proceedings of the *7th International Conference on Formal Engineering Methods (ICFEM)*, November 2005.

[24] Enforcing Non-safety Security Policies with Program Monitors. Jay Ligatti, Lujo Bauer, and David Walker. Proceedings of the *10th European Symposium on Research in Computer Security (ESORICS)*, September 2005.

[25] Composing Security Policies with Polymer. Lujo Bauer, Jay Ligatti, and David Walker. Proceedings of the ACM SIGPLAN *Conference on Programming Language Design and Implementation (PLDI)*, June 2005.

[26] Types and Effects for Non-interfering Program Monitors. Lujo Bauer, Jarred Ligatti, and David Walker. In M. Okada, B. Pierce, A. Scedrov, H. Tokuda, and A. Yonezawa, editors, *Lecture Notes in Computer Science: Software Security—Theories and Systems (Revised Papers of the 2002 Mext-NSF-JSPS International Symposium)*, Vol 2609, pp 154-171. Springer-Verlag, November 2003.

[27] A Theory of Aspects. David Walker, Steve Zdancewic, and Jay Ligatti. Proceedings of the ACM SIGPLAN *International Conference on Functional Programming (ICFP)*, August 2003.

Workshop Publications

[28] Enforcing More with Less: Formalizing Target-aware Run-time Monitors. Yannis Mallios, Lujo Bauer, Dilsun Kaynar, and Jay Ligatti. Proceedings of the *International Workshop on Security and Trust Management (STM)* (associated with ESORICS), September 2012.

[29] More Enforceable Security Policies. Lujo Bauer, Jarred Ligatti, and David Walker. Proceedings of the *Foundations of Computer Security Workshop (FCS)* (associated with LICS), July 2002.

Ph.D. Thesis

[30] Policy Enforcement via Program Monitoring. Jarred Adam Ligatti. PhD thesis, Princeton University, June 2006.

Patents

[31] System and Methods for Authentication using Multiple Devices. Jay Ligatti, Dmitry Goldgof, Cagri Cetin, Jean-Baptiste Subils. US Patent 9,659,160. May 2017.

[32] Adiabatic Dynamic Differential Logic for Differential Power Analysis Resistant Secure Integrated Circuits. Matthew Morrison, Jay Ligatti, and Nagarajan Ranganathan. US Patent 9,531,384. December 2016.

[33] Systems and Methods for Anonymous Authentication using Multiple Devices. Jay Ligatti, Dmitry Goldgof, Cagri Cetin, Jean-Baptiste Subils. US Patent 9,380,058. June 2016.

[34] Software security based on control flow integrity. Martín Abadi, Mihai Budiu, Úlfar Erlingsson, Jay Ligatti. US Patent 7,577,992. August 2009.

[35] Software memory access control. Martín Abadi, Mihai Budiu, Úlfar Erlingsson, Jay Ligatti. US Patent 7,337,291. February 2008.

Patent Applications

- Systems and Methods for Challengeless Coauthentication. Jay Ligatti. US Patent Application 15/644,371. Most recent filing in July 2017.

- Systems and Methods for Generating Symmetric Cryptographic Keys. Jay Ligatti, Cagri Cetin, Shamaria Engram, Dmitry Goldgof. US Provisional Patent Application No. 62/529,715. Filed July, 2017.

- Systems and Methods for Authentication Using Authentication Votes. Jay Ligatti and Dmitry Goldgof. US Patent Application 15/598,974. Most recent filing in May 2017.

Licensing

- The invention disclosed in US Patent 9,659,160 (System and Methods for Authentication using Multiple Devices) has been licensed. USF Patents & Licensing has also entered negotiations with other companies to license this technology.

Expert Witness Experience

- *BlackBerry Limited v. BLU Products, Inc.*, Case Number 16-23535-CIV-MORENO (December 2016-January 2017)
    - Studied case documents and drafted an expert report.

- *Industrial Engineering & Development et al v. Static Control Components*, Case Number 8:12-cv-691-T-24-MAP (November 2012-November 2014)
    - Studied documents, wrote expert and rebuttal reports, was deposed, and testified in federal court on technologies and patents related to access controls in printing systems.

- *John Sheppard et al v. Hillsborough County Sheriff's Office* (Nov-Dec 2012)

- Wrote programs to obtain and analyze information from personnel databases.

Industrial Experience

- *CACI* (March-July, 2012)
  Consultant on software security.
- *Microsoft Research* (Summer 2003)
  Created CFI (control-flow integrity) enforcement and proved its soundness.
- *Medical Software and Computer Systems* (Summers 2000-2001, Winter 2004)
  Software-security consultant; software engineer.

Teaching Experience

University of South Florida **[including number of students who completed each course]** (initial enrollments were typically 20-80% higher than the final enrollments shown here)

- *Foundations of Software Security (CIS 6373)*: Spring 2017 [11], 2016 [10], 2015 [9], 2014 [24], 2013 [15], 2012 [22], 2010 [19], 2008 [10], and 2007 [13]
- *Compilers (COP 4620)*: Fall 2017 [27], 2016 [19], 2015 [14], 2013 [24], 2011 [23], 2009 [13], and 2007 [21]
- *Compilers (COP 6625)*: Fall 2017 [5], 2016 [7], 2015 [9], 2013 [14], 2011 [11], 2009 [14], and 2007 [12]
- *Programming Languages (COP 4020)*: Spring 2017 [16], 2016 [17]; Fall 2014 [16], 2012 [23], 2010 [13], and 2008 [16]
- *Programming Languages (COP 6021)*: Spring 2017 [7], 2016 [7]; Fall 2014 [11], 2012 [8], and 2010 [14]
- *Advanced Programming Languages (CIS 4930)*: Spring 2015 [3] and 2011 [2]
- *Advanced Programming Languages (CIS 6930)*: Spring 2015 [11] and 2011 [11]
- *Operating Systems (COP 4600)*: Fall 2006 [44]
- *Independent Study (COP 4900 & 6900)*: (excluding my own research advisees) Summer 2017 [2], Spring 2017 [2], Fall 2016 [3], Summer 2016 [6], Spring 2016 [1], Spring 2015 [2], Fall 2014 [2], Summer 2014 [3], Spring 2014 [4], Fall 2013 [3], Summer 2013 [3], Spring 2013 [2], Fall 2012 [1], Summer 2012 [1], Spring 2012 [2], Fall 2011 [1], Summer 2011 [4], Spring 2011 [2], Fall 2010 [1], Spring 2010 [5], Summer 2009 [3], Spring 2009 [2], Fall 2008 [1], Summer 2008 [4], Spring 2008 [4], Fall 2007 [2], Summer 2007 [2], Spring 2007 [7]
- *Industry Internship (CIS 6946, IDS 3947, and CIS 4940)*: Summer 2017 [1], Spring 2017 [1], Fall 2016 [2], Summer 2016 [2], Spring 2016 [1], Spring 2015 [1], Spring 14 [1], and Summer 13 [1]

Princeton University (2001-2006)

- Teaching assistant for *Compiling Techniques (COS 320)*: Spring 2003 and 2006
- Preceptor (section lecturer) for *General Computer Science (COS 126)*: Fall 2002

Postdoc Supervised

- Donald Ray (2016, Afterward: Software Engineer at Google)

Research Students Advised

Ph.D. Students:

- Shamaria Engram (2015-present)
- Jean-Baptiste Subils (2014-present)
- Cagri Cetin (2014-present)
- Yan Albright (2014-present)
- Hernan Palombo (2013-present, co-advised with Hao Zheng)
- Danielle Ferguson (2012-present)
- Donald Ray (2011-2016) After graduation: Postdoc then Software Eng. at Google
- Daniel Lomsak (2008-2013) After graduation: Lead QA Eng. at Amer. Express
- Nalin Saigal (2006-2011) After graduation: Software Developer at Epic Systems

Master's Students:

- Michael Quintero (2015-present)
- Joshua Winfrey (2015-present)
- Ivory Hernandez (2015-present)
- Jacob Venne (2016-2017) After graduation: Business Intelligence Software Engineer at BST Global
- Kimberly Bursum (2015-2017) After graduation: Patent attorney
- Bader Albassam (2015-2016) After graduation: PhD student at Purdue
- Clayton Whitelaw (2014-2015) After graduation: Lead Developer at Amex
- Cory Juhlin (2013-2015) After graduation: Applications Developer at USIC LLC
- Grant Smith (2013-2014) After graduation: Software Engineer at Cybrix Group
- Zachary Carter (2010-2012) After graduation: Intern at Mozilla Labs
- Stan Naspinski (2010-2011) After graduation: Crew Commander at USAF, Software Engineer at General Dynamics, and Lead Soft. Eng. at APAN Software
- Matt Spaulding (2010-2011) After graduation: Software Engineer at Enporion
- Brandy Eyers (2009-2011) After graduation: Testing/QA at NexTech
- Josh Kuhn (2009-2011) After graduation: Programmer at Catalina Marketing
- Srikar Reddy (2007-2009) After graduation: PhD student at UC-Davis

REU Students:

- Shelsa Marcel (Summer 2013)
- Bader AlBassam (Fall 2012-Fall 2013)
- Jesse Squires (Summer 2011)
- Matt LaDuca (Summer 2011)
- DaShawn Matias (Fall 2010)
- Edwin Martinez Avila (Summer 2010)
- Robert Donatto (Fall 2009)
- Christine Cortes Hernandez (Summer 2008)
- Billy Rickey (Summer 2007)
- Humberto Gonzalez (Summer 2007)

USF Honors College Thesis Students:

- Edwin Peguero (Fall 2015)
- Thomas Dietert (Fall 2015)

- William Seed (Spring 2014)
- Bader Albassam (Spring 2014)
- Jonathan Palmer (Fall 2010)
- Donald Ray (Fall 2010)
- Bryan Hill (Spring 2009)
- Vincent Newman (Spring 2008)
- Amin Astaneh (Spring 2007)

Thesis Committees (besides those of my own students)

- Pubudu Kaluarachchilage, Ph.D., USF (Mathematics), 2017
- Sathya Sundaramurthy, Ph.D., USF, 2017
- Santosh Aditham, Ph.D., USF, 2017
- Ioannis (Yannis) Mallios, Ph.D., Carnegie Mellon University, 2016
- Nagalaxmi Yenuganti, M.S., USF, 2016
- Hari Jonnalagadda, M.S., USF, 2016
- Ryan Wheeler, M.S., USF, 2015
- Jae-Won Jang, M.S., USF, 2015
- Jeremy Blackburn, Ph.D., USF, 2014
- Egor Dolzhenko, Ph.D., USF (Mathematics), 2013
- Matthew Lewandowski, M.S., USF, 2013
- Christopher Bell, M.S., USF, 2013
- Nikolai Samteladze, M.S., USF, 2013
- Ismail Butun, Ph.D., USF (Electrical Engineering), 2013
- Jill Dizona, Ph.D., USF (Mathematics), 2012
- Nicolas Kourtellis, Ph.D., USF 2012
- Mehrgan Mostowfi, M.S., USF, 2010
- Paul Anderson, M.S., USF, 2010
- Konstantinos Dalamagkidis, Ph.D., USF, 2009
- Tine Verhanneman, Ph.D., Katholieke Universiteit Leuven, 2007

Invited Talks and Lectures

- *Modeling Enforcement Mechanisms with Security Automata*. USF Discrete Mathematics Seminar (09/2010)
- *An Introduction to Cryptography for Homeland Security*. USF Institute for Safety Security Rescue Technology (iSSRt) Distinguished Lecture (02/2008)
- *Coping with Runtime-Policy Complexity*. International Workshop on Run Time Enforcement for Mobile and Distributed Systems, Dresden Germany (09/2007)
- *Runtime Software Monitoring*. Carnegie Mellon University CyLab (08/2007)
- *Monitoring Software to Enforce Run-time Policies*. Microsoft Research-INRIA Joint Centre, Paris (03/2007)
- *Polymer: A Language and System for Specifying Complex, Modular Run-time Policies*. Katholieke Universiteit Leuven, Belgium (03/2007)
- *An Underappreciated Software-verification Technique*. IEEE-CS's USF-student-chapter meeting (02/2007)

- *Language-based Security*. ACM's USF-student-chapter meeting (02/2007)
- *New Research in Computer Security*. ACM's USF-student-chapter meeting (10/2006)
- *Enforcing Security Policies with Run-time Program Monitors*. Reservoir Labs-NYC (03/2006), University of Texas-Arlington (03/2006), Florida International University (03/2006), University of South Florida (02/2006), Kansas State University (02/2006)

Conference/Workshop Talks

- *A Technique for Proving Subtyping Completeness, with an Application to Iso-recursive Types*. ACM SIGPLAN Workshop on Types in Language Design and Implementation (Philadelphia, 2012)
- *A Theory of Runtime Enforcement, with Results*. European Symposium on Research in Computer Security (Athens, 2010)
- *Composing Security Policies with Polymer*. ACM SIGPLAN Conference on Programming Language Design and Implementation (Chicago, 2005)
- *Enforcing Non-safety Security Policies with Program Monitors*. European Symposium on Research in Computer Security (Milan, 2005)

Service

Program committees:

- International Symposium on Cyberspace Safety and Security (*CSS*), 2012-2016
- IEEE International Conference on Dependable, Autonomic, and Secure Computing (*DASC*), 2011, 2014.
- International Symposium on Engineering Secure Software and Systems (*ESSOS*), 2014-2015.
- IFIP International Conference on Formal Methods for Open Object-based Distributed Systems and International Conference on FORmal TEchniques for Networked and Distributed Systems (*FMOODS & FORTE*), 2010-2011
- IFIP International Conference on Formal Techniques for Distributed Objects, Components, and Systems (*FORTE*), 2014
- International Conference on Network and System Security (*NSS*), 2011
- ACM SIGPLAN Conference on Programming Language Design and Implementation (*PLDI*), external review committee, 2016
- Conference on Principles of Security and Trust (*POST*), 2016, 2018
- Conference on Privacy, Security and Trust (*PST*), 2012
- Annual ACM Symposium on Applied Computing: Software Verification and Testing Track (*SAC-SVT*), 2009-2011
- IEEE/ACIS International Conference on Software Engineering Research, Management and Applications (*SERA*), 2009-2011, 2014-2017
- International Conference on Software Engineering, Artificial Intelligence, Networking and Parallel/Distributed Computing (*SNPD*), 2012

Conference organization:

- Local Chair for the 2016 ACM Symposium on Principles of Programming Languages (*POPL*)

- Co-organizer of the "Grand Challenges in Programming Languages" panel at the 2009 ACM Symposium on Principles of Programming Languages (*POPL*)

Reviewer for many conferences and journals, including:

IEEE Computer Security Foundations Symposium (*CSF*), Computers and Security (*C&S*), ACM Computing Surveys (*ACMCS*), ACM Conference on Computer and Communications Security (*CCS*), Electronic Commerce and Research Applications (*ECRA*), European Symposium on Programming (*ESOP*), European Symposium on Research in Computer Security (*ESORICS*), Foundations of Software Technology and Theoretical Computer Science (*FSTTCS*), IEEE International Conference on Communications (*ICC*), IET Information Security (*IET-IFS*), International Journal of Information Security (*IJIS*), Information Processing Letters (*IPL*), Journal of Computer Security (*JCS*), Journal of Software Maintenance and Evolution (*JSME*), Journal of Systems and Software (*JSS*), Mathematical Structures in Computer Science (*MSCS*), ACM Workshop on Programming Languages and Analysis for Security (*PLAS*), ACM Symposium on Programming Languages Design and Methodology (*PLDI*), ACM Symposium on Principles of Programming Languages (*POPL*), International Conference on Runtime Verification (*RV*), Science of Computer Programming (*SCP*), Software Tools and Technology Transfer (*STTT*), Software Testing Verification and Reliability (*STVR*), IEEE Transactions on Computers (*TC*), IEEE Transactions on Dependable and Secure Computing (*TDSC*), IEEE/ACM Transactions on Networking (*ToN*), ACM Transactions on Programming Languages and Systems (*TOPLAS*), ACM Transactions on Privacy and Security (*TOPS*), ACM Transactions on Software Engineering and Methodology (*TOSEM*).

NSF Service:

- National Science Foundation panelist (2008, 2009, 2016)

USF CSE Department Service:

- Graduate-program Committee (2006-present)
- Tenure and Promotion Committee (2012-present)
- Data and Decisions Support (formerly Planning and External Relations) Committee (2013-present)
- Faculty-search Committee (2011-2015)
- Mentoring Committee (2012-2016)

USF College of Engineering Service:

- Engineering Research Advisory Council (2012-present)
- Cybersecurity Faculty-search Committee (2014-2015)

USF Service:

- Florida Center for Cybersecurity (FC^2) Curriculum Assessment Group (2016)

Community Service:

- Judge, Florida State Science and Engineering Fair (2009-present)
- Judge, Hillsborough County Regional Science Fair (2007-2013)

Funding

- *TWC: Small: Techniques and Tools for Enforcing Proximity-based Policies in Wireless Systems*. Yao Liu (PI) and Jay Ligatti (co-PI). NSF SaTC award CNS-1527144. Project dates: 9/1/15-8/31/18. Amount: $300,000.
- *II-New: A research platform for heterogeneous, massively parallel computing*. Yicheng Tu (PI), Swaroop Ghosh (co-PI), Jay Ligatti (co-PI), Sagar Pandit (co-PI), Sudeep Sarkar (co-PI). NSF CRI award CNS-1513126. Project dates: 7/1/15-6/30/2018. Amount: $679,798.
- *Collaborative Authentication for the Internet of Things*. Jay Ligatti (PI) and Daniela Oliveira (co-PI at University of Florida). Sponsor: Florida Center for Cybersecurity (FC^2). Project dates: 7/1/17-6/30/18. Amount: $25,000 (USF) + $25,000 (University of Florida).
- *Analysis of Cryptographic Primitives and Protocols* (for VTE, Virtual Tunneling Effect). Jay Ligatti (PI), Yao Liu (co-PI), and Dmitry Goldgof (co-PI). Sponsor: CBT Holding, LLC. Project dates: 5/9/16-5/8/17. Amount: $56,649 + $56,649 matching from the Florida High Tech Corridor.
- *Practical Improvements to Network Security Infrastructure*. Jay Ligatti (PI). Sponsor: Impulse Point, LLC. Project dates: 9/1/15-5/5/17. Amount: $70,146 + $70,146 matching from Florida High Tech Corridor.
- *Cyber Resilience for Injection Attacks*. Jay Ligatti (PI) and Geoffrey Smith (co-PI at Florida International University). Sponsor: Florida Center for Cybersecurity (FC^2). Project dates: 3/1/15-5/31/17. Amount: $50,000 (USF) + $50,000 (Florida International University).
- *Development of Network-security Tools*. Jay Ligatti (PI). Sponsor: Impulse Point, LLC. Project dates: 3/1/13-12/31/13. Amount: $61,356 + $61,356 matching from Florida High Tech Corridor.
- *Development of a Marketplace Portal Framework*. Jay Ligatti (PI). Sponsor: Enporion. Project dates: 1/1/11-12/31/11. Amount: $68,855 + $68,855 matching from Florida High Tech Corridor.
- *Avatar DNA using Biometrics and User Access Controls*. Sudeep Sarkar (PI) and Jay Ligatti (Co-PI). Sponsor: The Raytheon Company. Project dates: 1/2/09-8/24/10. Amount: $60,000 + $29,250 matching from Florida High Tech Corridor.
- *Security-research Partnership between USF and Team TACLAN: Wireless Security*. Jay Ligatti (PI), Rangachar Kasturi (co-PI). Sponsor: Team TACLAN. Project dates: 10/1/08-9/30/09. Amount: $133,333.
- *Collaborative Research - ANET: Mobius: A Multi-Tier Socially-Aware Network Infrastructure*. Adriana Iamnitchi (PI), Jay Ligatti (co-PI), Cristian Borcea (PI at NJ Inst of Tech), and Quentin Jones (co-PI at NJ Inst of Tech). NSF NeTS awards CNS-0831785 (USF) and CNS-0831753 (NJIT). Project dates: 9/1/08-8/31/12. Amount: $429,999 (USF) + $409,978 (NJIT).
- *CAREER: Foundational Theories and Enforcement Tools for Secure Software Systems*. Jay Ligatti (PI). NSF award CNS-0742736. Project dates: 2/1/08-1/31/2014. Amount: $412,771 + $8,000 (supplemental REU funding).
- *CT-ISG: Collaborative Research: Trustworthy Enforcement of Domain-independent Run-time Policies*. Jay Ligatti (PI), Adriana Iamnitchi (co-PI), and Lujo Bauer (co-PI at Carnegie Mellon University). NSF CyberTrust awards

CNS-0716343 (USF) and CNS-0716216 (CMU). Project dates: 8/1/07-7/31/11. Amount: $300,000 (USF) + $50,000 (CMU).

- *Security-research Partnership between USF and Team TACLAN*. Jay Ligatti (PI), Rangachar Kasturi (co-PI). Sponsor: Team TACLAN. Project dates: 8/24/07-8/23/08. Amount: $114,189.