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# T. Charles Clancy, PhD

## Personal Summary

I am a successful academic executive, research innovator, and entrepreneur who currently directs Virginia Tech's Hume Center. I joined Virginia Tech to help launch the Hume Center in 2010 and bootstrapped its growth with the award of \$100M in grants and contracts to now support over 75 professors, researchers, and staff, and engage over 400 students per year in national security and cybersecurity programs. Additionally I have worked with the venture community to spin four companies off from the university that have raised over \$75M since 2012. His enterprises have created over 200 jobs from Blacksburg to Boston.

Clancy is an internationally-recognized expert in wireless security, and has led groundbreaking programs in spectrum security, cryptographic authentication, and physical-layer resilience. He is currently working on security for IoT and 5G. He serves in leadership roles within the IEEE Communication Society (COMSOC) and Signal Processing Society (SPS), and has served on the editorial boards for *IEEE Transactions on Information Forensics and Security (TIFS)* and *IEEE Transactions on Cognitive Communications and Networking (TCCN)*. He is co-author to five books, over 20 patents, and over 200 academic publications.

## Education

### University of Maryland, College Park, MD

*Ph.D.*, Computer Science

2006

### University of Illinois, Urbana-Champaign, IL

*M.S.*, Electrical Engineering

2002

### Rose-Hulman Institute of Technology, Terre Haute, IN

*B.S.*, Computer Engineering

2001

## Experience

### Virginia Tech, Arlington, VA

*Director*, Hume Center for National Security and Technology

2011–present

*Professor*, Electrical and Computer Engineering

2017–present

*Associate Professor*, Electrical and Computer Engineering

2011–2017

*Associate Director*, Hume Center for National Security and Technology

2010–2011

### National Security Agency, Fort Meade, MD

*Engineering Leader*, Laboratory for Telecommunications Sciences

2008–2010

*Senior Researcher*, Laboratory for Telecommunications Sciences

2006–2008

*Researcher*, Laboratory for Telecommunications Sciences

2004–2006

*Summer Hire*, Engineering Internship Program

2000–2004

### University of Maryland, College Park, MD

*Adjunct Assistant Professor*, Electrical and Computer Engineering

2007–2010

*Affiliate Researcher*, UM Institute for Advanced Computer Studies

2003–2010

*Graduate Research Assistant*, Computer Science

2004–2005

*Graduate Teaching Assistant*, Computer Science

2003–2004

### University of Illinois, Urbana-Champaign, IL

*Graduate Research Assistant*, Electrical and Computer Engineering

2002–2003

*Graduate Teaching Assistant*, Electrical and Computer Engineering

2001–2002

### Indiana University/Purdue University, Indianapolis, IN

*Adjunct Instructor*, Office of Continuing Studies

2001–2003

*Software Engineer*, Community Learning Network

1998–2003

### Rose-Hulman Institute of Technology, Terre Haute, IN

<i>UNIX Systems Architect, Instructional and Administrative IT</i>	2001
<i>Systems Administrator and Webmaster, Department of Mathematics</i>	2000–2001
<i>Systems and Network Administrator, Department of Computer Science</i>	1998–2001

### Awards

<i>40 Under 40 Honoree, Leadership Arlington</i>	2015
<i>Deans Award for Research Excellence, Virginia Tech College of Engineering</i>	2014
<i>L-3 Communications Faculty Fellowship, Virginia Tech College of Engineering</i>	2013
<i>GAP-50 Finalist (Entrepreneurship Award), Commonwealth of Virginia</i>	2012
<i>Secretary of Defense Medal for the Global War on Terrorism, Department of Defense</i>	2011
<i>Best Student Paper Runner Up, IEEE Workshop on Signal Processing Systems</i>	2011
<i>Senior Member Status, Institute of Electrical and Electronics Engineers</i>	2010
<i>Letter of Commendation, United States Forces Iraq J6</i>	2010
<i>Outstanding Paper Award, SDR Forum Technical Conference</i>	2007
<i>Joint Meritorious Unit Award, National Security Agency</i>	2007
<i>Outstanding Paper Award, SDR Forum Technical Conference</i>	2006
<i>Deckert-Foster SIGINT Engineering Award, National Security Agency</i>	2006
<i>Best Paper Award, Virginia Tech Wireless Symposium</i>	2006
<i>Joint Meritorious Unit Award, National Security Agency</i>	2004
<i>Graduate Fellowship, University of Maryland, Department of Computer Science</i>	2003

### Professional Societies

#### Institute for Electrical and Electronics Engineers (IEEE)

##### Membership Levels

<i>Senior Member, IEEE</i>	2010–present
<i>Member, IEEE</i>	2006–2010
<i>Student Member, IEEE</i>	2003–2006

##### Society Membership

<i>Member, IEEE Signal Processing Society</i>	2012–present
<i>Member, IEEE Communications Society</i>	2010–present

##### Technical Committee Membership

<i>Elected Member, Information Forensics and Security (IFS-TC)</i>	2013–present
<i>Voting Member, Technical Committee on Cognitive Networks (TCCN)</i>	2013–present
<i>Member, Comms and Information Security (CISTC)</i>	2011–present

##### Technical Committee Assignments

<i>Education Committee Chair, IFS-TC</i>	2015–present
<i>Awards Committee Member, IFS-TC</i>	2015–present
<i>Communications Security Area Chair, IFS-TC</i>	2014–present
<i>North America Regional Representative, IFS-TC</i>	2014
<i>Member, Technical Directions, IFS-TC</i>	2014
<i>Vice Chair, TCCN Cognitive Network Security Special Interest Group</i>	2013–present

#### Armed Forces Communications and Electronics Association (AFCEA)

<i>Member, AFCEA</i>	2012–present
<i>Elected Member, AFCEA Intelligence Committee</i>	2015–present

### Journal Editorships

<i>Editor, IEEE Transactions on Cognitive Communications and Networks</i>	2014–2017
<i>Associate Editor, IEEE Transactions on Information Forensics and Security</i>	2012–2015

### Conference Leadership

#### Conference Leadership

<i>Co-Organizer, AFCEA/INSA National Security Summit</i>	2017
<i>Co-Organizer, AFCEA Intelligence Symposium</i>	2016
<i>Workshop Co-Chair, IEEE Personal, Indoor and Mobile Radio Comms (PIMRC)</i>	2014
<i>TPC Co-Chair, IEEE Dynamic Spectrum Access Networks (DySPAN)</i>	2014
<i>Patron Co-Chair, IEEE Communication and Network Security (CNS)</i>	2013

<i>Co-Chair, ACM Cognitive Radio Architectures for Broadband (CRAB) Workshop</i>	2013
<i>Co-Chair, IEEE Security in Communications Networks Workshop</i>	2012
<i>TPC Co-Chair, IEEE ICC Cognitive Radio Networks Symposium</i>	2012
<i>Co-Chair, Open Source Workshop, Wireless Innovation Forum</i>	2011
<i>Co-Chair, SDR Forum Open Source Workshop</i>	2011
<i>Tutorial Chair, Virginia Tech Wireless Symposium and Summer School</i>	2011
<i>Chair, GNU Radio Future Directions Workshop</i>	2009, 2010
<i>General Chair, WLAN/WMAN Symposium, Department of Defense</i>	2006, 2008

#### **Technical Program Committee Member**

<i>IEEE Military Communications Conference (MILCOM)</i>	2014, 2015, 2016, 2017
<i>IEEE Intl Workshop on Information Forensics and Security (WIFS)</i>	2015, 2016, 2017
<i>IEEE Dynamic Spectrum Access Networks (DySPAN)</i>	2017
<i>IEEE Vehicular Technologies Conference (VTC)</i>	2017
<i>IEEE Intl Conference on Acoustics, Speech and Signal Proc (ICASSP)</i>	2014, 2015, 2016
<i>Workshop on Security in Cloud Computing, ACM AsiaCCS</i>	2015
<i>IEEE Intl Conference on Computing, Networking and Comms (ICNC)</i>	2015
<i>IEEE Cognitive Radio and Electromagnetic Spectrum Security (CRESS)</i>	2014
<i>IEEE Global Conference on Signal and Infor Processing (GlobalSIP)</i>	2013, 2014
<i>IEEE Global Communications Conference (GLOBECOM)</i>	2012, 2014
<i>Conference on Decision and Game Theory for Security (GameSec)</i>	2011
<i>ICST Security in Emerging Wireless Comms and Networking Systems</i>	2009

#### **Standards Bodies**

<i>Steering Group Member, WinnF Spectrum Sharing Committee (SSC)</i>	2014–present
<i>Chair, WinnF SSC Security Working Group</i>	2014–present
<i>Vice Chair, DoD IEEE 802.16 Secure Profile Working Group</i>	2009–2010
<i>Chair, Security Task Force, DoD IEEE 802.16 Secure Profile Working Group</i>	2009–2010
<i>Member, WinnF Educational Working Group</i>	2007–2010
<i>Co-Chair, IETF Handover Keying Working Group</i>	2006–2009
<i>Member, IETF Security Directorate</i>	2006–2009
<i>Security Advisor, IETF CAPWAP Working Group</i>	2006–2008
<i>Security Advisor, IETF Extensible Authentication Protocol Working Group</i>	2005–2007
<i>Member, IEEE 802.22 Spectrum Sensing Task Force</i>	2005–2006

#### **Professional Service**

<i>Member, Defense Policy Working Group, Hillary for America</i>	2015–present
<i>Star Mentor, Mach37 Cybersecurity Incubator</i>	2014–present
<i>Member, STEM Committee, Fairfax County Public Schools</i>	2013–present
<i>Member, JCOTS Cyber Security Panel, Virginia General Assembly</i>	2012–present
<i>Co-Director, NSF Security and Software Engineering Research Center</i>	2011–present
<i>Member, JIEDDO Enduring Capabilities Working Group</i>	2012
<i>Review Panel Member, National Science Foundation</i>	2010
<i>Steering Committee, NSF EARS Workshop</i>	2010
<i>Amateur Radio Operator, American Radio Relay League</i>	2001–present

#### **University Service**

##### **Committees and Advisor Roles**

<i>Stakeholders Committee, Integrated Security Destination Area</i>	2016–present
<i>Faculty Design Team, Integrated Security Destination Area</i>	2016
<i>Steering Group, Integrated Security Destination Area</i>	2015–2016
<i>Network Inf and Services Advisory Committee, VP for IT</i>	2011–present
<i>Networks Area Committee, Electrical and Computer Engineering</i>	2012–present
<i>Communications Area Committee, Electrical and Computer Engineering</i>	2011–present
<i>Scholarship Selection Committee, Hume Center</i>	2010–present
<i>Faculty Advisor, Student Cybersecurity Club</i>	2011–2014
<i>Area Recruiting Representative, Communications Area, ECE</i>	2012–2013
<i>Review Panel Member, ICTAS Joint Faculty Collaborative Program</i>	2011

**Faculty Search Committees**

<i>Member, Dean, College of Engineering</i>	2016–2017
<i>Chair, Director, Information Systems Lab, Hume Center</i>	2016
<i>Member, Asst Prof, Cyber-Physical Security, Computer Engineering</i>	2015–2016
<i>Chair, Assoc Director for Info Systems, Hume Center</i>	2015
<i>Member, Vice President, National Capital Region</i>	2013
<i>Member, Associate Vice President, National Capital Region</i>	2013
<i>Chair, Asst Prof, Software Security, Computer Engineering</i>	2012–2013
<i>Chair, Portfolio Director, Hume Center</i>	2012
<i>Member, Asst Prof, Software Security, Computer Engineering</i>	2011–2012
<i>Member, Asst Prof, Cyber Security, Computer Science</i>	2010–2011

**Entrepreneurship  
and Consulting**

<i>Co-Founder, HawkEye 360 Inc</i>	2015–present
<i>Co-Founder, Federated Wireless Inc</i>	2012–present
<i>Co-Founder, Optio Labs Inc</i>	2012–2017
<i>President and Founder, Stochastic Research LLC</i>	2009–present
<i>Advisory Board Member, Votem Inc</i>	2015–2016
<i>Consultant, Barr Group Inc</i>	2013–2014
<i>Consultant, Center for Innovative Technologies</i>	2011
<i>Consultant, Chemring North America</i>	2014
<i>Consultant, CTIA – The Wireless Association</i>	2013–present
<i>Consultant, Eogogics Inc</i>	2011–2013
<i>Consultant, FastIraq Inc</i>	2010–2011
<i>Consultant, IDA Center for Computer Sciences</i>	2010–2013
<i>Consultant, Litmore LLC</i>	2012
<i>Consultant, Lyric Semiconductor</i>	2010–2011
<i>Consultant, Millennium Space Systems</i>	2014–2015
<i>Consultant, Office of the Secretary of Defense</i>	2013–2016
<i>Consultant, Netgear</i>	2011–2012
<i>Consultant, WAA Associates LLC</i>	2003–2005

**Teaching****Curriculum Development**

<i>Cyber Security Graduate Certificate, Virginia Tech, College of Engineering</i>	2013
<i>Cyber Security Undergraduate Minor, Virginia Tech, College of Engineering</i>	2012
<i>Cyber Security Seminar, Virginia Tech, Electrical and Computer Engineering</i>	2011
<i>Information and Network Security, University of Maryland, MS Telecomms</i>	2008

**University Courses**

<i>CyberLeaders Capstone (SPIA 4984), Virginia Tech</i>	2017
<i>Telecommunication Networks (ECE 4614), Virginia Tech</i>	2011, 2013, 2016
<i>Network Security (ECE/CS 5584), Virginia Tech</i>	2015
<i>Network Architecture and Protocols II (ECE/CS 5566), Virginia Tech</i>	2012
<i>Special Study: Control Theory and the Dynamics of Cybersecurity, Virginia Tech</i>	2014
<i>Network Architecture and Protocols I (ECE/CS 5565), Virginia Tech</i>	2013
<i>Information Theory (ECE 5634), Virginia Tech</i>	2011
<i>Communications Networks (ENEE 426), University of Maryland</i>	2008, 2009
<i>Information and Network Security (ENTS 689i), University of Maryland</i>	2008
<i>Teaching Assistant, Cryptology (CMSC 456), University of Maryland</i>	2003
<i>Teaching Assistant, Communication Networks (ECE 438), University of Illinois</i>	2001

**Short Courses, Seminars, and Tutorials**

<i>Numerical Methods and Analysis (40 hours), Navy SPAWAR Atlantic</i>	2015
<i>Cybersecurity Technologies and Tactics (8 hours), Fujitsu Ltd</i>	2014
<i>Cellular Core Networks (40 hours), US Special Operations Command (SOCOM)</i>	2012
<i>Wireless Comms and Security (40 hours), Office of the Secretary of Defense</i>	2012

<i>Android Security (6 hours)</i> , L-3 Communications	2012
<i>Cyberwarfare Strategy (6 hours)</i> , Joint Inter-American Defense College	2011, 2012
<i>Security for Tactical Wireless (4 hours)</i> , VT Wireless Summer School	2011
<i>Wireless 4G Communications (8 hours)</i> , ProObject Speaker Series	2010
<i>Intro to WLAN Security (8 hours)</i> , DOD Cryptanalytic Program	2005, 2006, 2008, 2009
<i>Wireless Networks (24 hours)</i> , DOD Resident Signal Engineers Program	2007
<i>Software-Defined and Cognitive Radio (4 hours)</i> , IEEE MILCOM	2007
<i>UNIX Systems Admin using Solaris (16 hours)</i> , Indiana University	2001, 2002, 2003
<i>Computer and Network Security (16 hours)</i> , Indiana University	2001

## Sponsored Research

### \$35M in Total Grant/Contract Awards

1. T. Clancy, P. Schaumont, "Security and Software Engineering Research Center @ Virginia Tech – Phase II," National Science Foundation (NSF), **\$300K**, 2017-2020
2. J. Black, T. Clancy, A. Wicks, M. Fowler, "Integrated Cognition for Electromagnetic Squad Defense," Defense Advanced Research Projects Agency (DARPA/TTO), with CACI, **\$1,552K**, 2017-2019
3. W. Headley, T. Clancy, J. Black, R. McGwier, "Software-Defined Radio Satellite Payload," sensitive sponsor, **\$750K**, 2017-2018
4. T. Clancy, S. Rahman, "Mapping Industrial Control Systems," Office of the Secretary of Defense, **\$150K**, 2016-2017
5. T. Clancy, "Analyzing End-to-End Encryption with Deep Learning," NSF Security and Software Engineering Research Center, **\$50K**, 2016-2017
6. T. Clancy, T. O'Shea, "Deep Learning-Based RF Emitter Characterization," Lockheed Martin Corporation, **\$600K**, 2016-2018
7. K. Heaslip, T. Clancy, J. Ernst, "Cybersecurity Vulnerability Assessment of Intelligent Transportation Infrastructure," District of Columbia Department of Transportation, with G2 Inc, **\$474K**, 2016-2017
8. T. Chantem, E. Tilevich, T. Clancy, "Compiler Tools for Critical Program Information Protection," Office of the Secretary of Defense, **\$500K**, 2016-2018
9. A. Abdelhadi, T. Clancy, "Security Analysis of Wireless Connections for Remote Sensors," Airbus, **\$40K**, 2015-2017
10. A. Abdelhadi, T. Clancy, "Attack Detection Methods for Threats Coming from the IoT," Airbus, **\$40K**, 2015-2017
11. T. Clancy, J. Black, N. Ramakrishnan, M. Marathe, "SIGINT-based Anticipation of Future Events," Intelligence Advanced Research Projects Activity (IARPA), with USC-ISI, Next Century, and Draper Labs, **\$2,500K**, 2016-2019
12. A. Michaels, T. Clancy, J. Ernst, R. McGwier, "Tackling WiFi Interference and Co-Channel Excision," sensitive sponsor, **\$1,396K**, 2015-2016
13. T. Clancy, T. O'Shea, J. Black, "Distributed Coordination among Tactical Electronic Warfare Platforms," Defense Advanced Research Projects Agency (DARPA/TTO), with CACI, **\$1,968K**, 2015-2017
14. T. Clancy, T. O'Shea, "Bayesian Algorithms for Pattern of Life Estimation and Forecasting in RF Environments," sensitive sponsor, **\$585K**, 2015-2017
15. T. Clancy, "Closed-Loop Cognitive Electronic Warfare Operations with Cyber Feedback," Office of Naval Research (ONR), **\$694K**, 2015-2016
16. J. Tront, T. Clancy, "Virginia Tech GenCyber Summer Camp," National Security Agency (NSA), **\$100K**, 2015

17. T. Clancy, R. McGwier, "Mission Feasibility Study and Prototyping for Software Radio Waveforms," sensitive sponsor, **\$1,392K**, 2014-2016
18. T. Clancy, M. Fowler, "Heterogeneous Parallel Mobile Computing for Cognitive Electronic Warfare," Office of Naval Research (ONR), **\$894K**, 2014-2016
19. T. Clancy, "Exploitation of Android Ad Libraries," L-3 Communications, **\$44K**, 2014-2015
20. T. Clancy, "Machine Learning for Target Models in Cognitive Electronic Warfare," L-3 Communications, **\$42K**, 2014-2015
21. T. Clancy, R. McGwier, "Resilient Tactical SATCOM Using Cognitive Radio: Phase 2," Air Force Research Labs (AFRL), with Shared Spectrum Company, **\$293K**, 2014-2015
22. J. Tront, T. Clancy, K. Cooper, "Virginia Tech CyberCorps: Federal Scholarship for Service," National Science Foundation (NSF), **\$3,909K**, 2013-2018
23. R. McGwier, T. Clancy, "Experimental Software Defined Radio," Harris Corporation, **\$110K**, 2014
24. T. Clancy, A. Abdelhadi, R. McGwier, "Spectral Coexistence using MIMO Radar Platforms," Defense Advanced Research Projects Agency (DARPA/STO), **\$349K**, 2013-2014
25. R. McGwier, T. Clancy, "Tactical Platforms for Advanced Electronic Warfare," Air Force Research Labs (AFRL), **\$498K**, 2013-2014
26. T. Clancy, R. McGwier, "Satellite Communications using DSA under Spectral Uncertainty," Air Force Office of Scientific Research (AFOSR), with Shared Spectrum Company, **\$56K**, 2013-2014
27. R. Tandon, T. Clancy, "Physical Layer Security: Information Theoretic Approach to Jamming," L-3 Communications, **\$237K**, 2013-2014
28. S. Shukla, T. Clancy, "Application-Specific Firewall Synthesis Tool for High-Assurance Systems," L-3 Communications, **\$162K**, 2013-2014
29. S. Sodagari, T. Clancy, "Using Asynchronous Weak-Commitment Search for Distributed Constraint Satisfaction for Autonomous Network Management," Office of Naval Research (ONR), **\$75K**, 2013-2015.
30. P. Athanas, T. Clancy, "Novel Applications of FPGA Logic," Air Force Research Labs (AFRL), with USC Information Sciences Institute, **\$994K**, 2013-2014
31. P. Athanas, R. Buehrer, R. McGwier, J. Reed, T. Clancy, "Software Defined Radio Technology Development," sensitive sponsor, **\$955K**, 2012-2015
32. T. Clancy, "Advanced Threat Development for Cognitive Electronic Warfare Platforms," Defense Advanced Research Projects Agency (DARPA/I2O), with MIT Lincoln Labs, **\$300K**, 20122013
33. T. Clancy, "Distributed/Cognitive EW for Agile/Adaptive Systems," Air Force Research Labs (AFRL), with MacAulay Brown, **\$142K**, 20122013
34. R. McGwier, T. Clancy, P. Athanas, J. Reed, R. Buehrer, A. Beex, "Advanced Wideband Systems and Technologies," sensitive sponsor, **\$8,690K**, 20122015
35. T. Clancy, R. McGwier, J. Reed, "Sharing and Shaping 4G Cellular Resources," Allied Minds Federal Innovations, **\$425K**, 20122013
36. J. White, C. Dietrich, J. Reed, T. Clancy, R. McGwier, "Software Defined Radio Deployment Optimization," sensitive sponsor, **\$205K**, 20122013

37. S. Sodagari, T. Clancy, R. McGwier, "Resilient Tactical SATCOM Using Cognitive Radio: Phase 1," Air Force Research Labs (AFRL), with Shared Spectrum Company, **\$40K**, 2012
38. T. Clancy, "Security and Robustness of TD-LTE for Public-Safety Communications," NSF Security and Software Engineering Research Center (S2ERC), **\$20K**, 2012
39. T. Clancy, D. Yao, M. Hsiao, J. Park, J. Tront, "S2ERC @ Virginia Tech Cyber Security Industry/University Cooperative Research Center," National Science Foundation (NSF), **\$325K**, 2011-2016
40. T. Clancy, R. McGwier, S. Sodagari, "Spectral Coexistence through Cognitive Radar," Office of Naval Research (ONR), with Shared Spectrum Company, **\$1,482K**, 2011-2014
41. T. Clancy, "Cognitive Electronic Warfare," Naval Research Laboratory (NRL), **\$297K**, 2011-2014
42. T. Clancy, "Android Smartphone System Security," L-3 Communications, **\$318K**, 2011-2012
43. T. Clancy, "High Performance IPv6 Security Gateway," Department of Homeland Security (DHS), with Centripetal Networks Inc, **\$35K**, 2011-2012
44. T. Clancy, "Android Operating System Security," Naval Postgraduate School (NPS), **\$109K**, 2011-2012
45. R. McGwier, T. Clancy, B. Agee, "Low-Cost Communications Satellite Design," Los Alamos National Labs (LANL), **\$292K**, 2011-2012
46. T. Clancy, R. Buehrer, "Cellular Network Security Research," Aerospace Corporation, **\$129K**, 2011-2012
47. T. Clancy, "Mobility and Spectrum Security Strategy and Policy," Office of the Assistant Secretary of Defense and Chief Information Officer (DOD CIO), with JHU Applied Physics Laboratory, **\$250K**, 2011-2012
48. T. Clancy, "Secure Spectrum Access Policy Research," Defense Advanced Research Programs Agency (DARPA/STO), with Shared Spectrum Company, **\$50K**, 2011-2012
49. T. Clancy, "Mobile Wireless Communications Research," JHU Applied Physics Laboratory (APL), **\$35K**, 2011
50. T. Clancy, "Cognitive Electronic Warfare," Virginia Tech Institute for Critical Technologies and Applied Sciences (ICTAS), **\$40K**, 2011
51. T. Clancy, "Dynamic Spectrum Access Security Study," Office of the Assistant Secretary of Defense for Networks and Information Integration (ASD-NII), with Shared Spectrum Company, **\$150K**, 2010-2011

## Research Agreements

### IDIQ Contract Vehicles

1. US CYBERCOM, *Omnibus R&D*, subcontractor to SAIC, 2016–2021
2. Defense Intelligence Agency, *DORE*, subcontractor to CACI, 2015–2020
3. Defense Technical Information Center, *Cybersecurity Technical Area Task (CS-TAT)*, subcontractor to Macaulay Brown, 2015–2021
4. Defense Intelligence Agency, *E-SITE*, subcontractor to CACI and Occam, 2014–2019
5. US Army TACOM, *Omnibus III*, subcontractor to Leidos, 2014–2018
6. Air Force Research Labs, *ANSWER Program*, subcontractor to Macaulay Brown, 2014–2019

7. Air Force Research Labs, *SMIRF Program*, subcontractor to Macauly Brown, 2014–2019
8. US Army CERDEC, *TAOSS Program*, subcontractor to Systek, 2013–2018
9. Air Force Research Labs, *Agile Cyber Technologies*, subcontractor to L-3 Communications, 2012–2018
10. Air Force Research Labs, *IDARE Program*, subcontractor to Macauly Brown, 2012–2017

#### Cooperative Research and Partnership Agreements

1. US Army CERDEC, *Cyber Operations*, CRADA, 2011–2021
2. CACI, *UAS Cybersecurity Research*, Partnership Agreement, 2015–2019
3. Center for Innovative Technologies, *Mach37 Accelerator Testbed Support*, Partnership Agreement, 2013–2016
4. Defense Intelligence Agency, *Science and Technology Research*, CRADA, 2013–2016
5. National Intelligence University, *Cyber Education*, Partnership Agreement, 2012–2015
6. L-3 Communications, *National Security Research*, Partnership Agreement, 2011–2015

#### Current Students

##### PhD Students

Amr Abed	2014–present
Dane Brown	2014–present
Tugba Erpek	2013–present
Michael Fowler	2012–present
Seth Hitefield	2012–present
Jasmin Mahal	2013–present
Jason McGinthy	2016–present
John Narayan	2014–present
Tim OShea	2014–present
Wile Sehery	2012–present

##### Masters Students (with thesis)

Steven Hauser	2016–present
Kevin Ryland	2016–present
Robert Smith	2015–present
Charles Suslowicz	2016–present
Korey Weeks	2015–present

##### Masters Students (non-thesis)

Joel Anderson	2015–present
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#### Students Graduated

##### PhD Students

1. Mohamed Ghorbanzadeh, “Resource Allocation and End-to-End Quality of Service for Cellular Communications Systems in Congested and Contested Environments,” PhD ECE, Virginia Tech, 2015
2. Nathan Goergen (co-advised with R. Liu), “Extrinsic Channel-Like Fingerprinting for Transmitter Authentication in Wireless Systems,” PhD ECE, University of Maryland, 2011
3. Awais Khawar, “Spectrum Sharing between Radar and Communication Systems,” PhD ECE, Virginia Tech, 2015



4. Akshay Kumar (co-advised with R. Tandon), "Efficient Resource Allocation Schemes in Wireless Networks with Diverse Quality-of-Service Requirements," PhD ECE, Virginia Tech, 2016
5. Matt La Pan, "Security Issues for Modern Communications Systems: Fundamental Electronic Warfare Tactics for 4G Systems and Beyond," PhD ECE, Virginia Tech, 2014
6. Avik Sengupta (co-advised with R. Tandon), "Fundamentals of Cache Aided Wireless Networks," PhD ECE, Virginia Tech, 2016
7. Chowdhury Shahriar, "Resilient Waveform Design for OFDM-MIMO Communication Systems," PhD ECE, Virginia Tech, 2015
8. Haya Shajaiah, "Resource Allocation with Carrier Aggregation for Spectrum Sharing in Cellular Networks," PhD ECE, Virginia Tech, 2016

#### **Masters Students (with thesis)**

1. Yang Chen, "Robust Prediction of Large Spatio-Temporal Datasets," MS CS, Virginia Tech, 2013
2. Kiran Karra, "Wireless Distributed Computing on the Android Platform," MS ECE, Virginia Tech, 2012
3. Awais Khawar, "Spectrum Sensing Security in Cognitive Radio Networks," MS ECE, University of Maryland, 2010
4. Neelima Krishnan, "Android Hypovisors: Securing Mobile Devices through High-Performance, Light-Weight, Subsystem Isolation with Integrity Checking and Auditing Capabilities," MS CS, Virginia Tech, 2014
5. Rebecca Kurlle, "Resource Allocation for Smart Phones in 4G LTE-Advanced Carrier Aggregation," MS ECE, Virginia Tech, 2012
6. Marc Lerch, "Using Decoys as a Resiliency Mechanism in Spectrally Harsh DSA Environments," MS ECE, Virginia Tech, 2014
7. Zhongmin Ma, "Android Application Install-time Permission Validation and Run-time Malicious Pattern Detection," MS ECE, Virginia Tech, 2013
8. Andrew Pham, "An Implementation of Utility-Based Traffic Shaping on Android Devices," MS ECE, Virginia Tech, 2014
9. David Sowers, "Architecture for Department of Defense Mobile Derived Credentials," MS ECE, Virginia Tech, 2014
10. Jeremy Tate, "Security Weaknesses of the Android Advertising Ecosystem," MS ECE, Virginia Tech, 2014

#### **Masters Students (non-thesis)**

1. Timothy Buttner, "RF Network on Chip (RF-NoC) based Polyphase Filter Bank Implementation," MEng ECE, Virginia Tech, 2015
2. Kristina Freeman, "Applying Cognitive Radio Techniques in 5G Wireless," MEng ECE, Virginia Tech, 2012
3. Robert Horst, "Security in the LTE S1-MME Link," MEng ECE, Virginia Tech, 2014
4. Tyler Howell, "Influence of Concurrent Processing in a Microcontroller on AES Correlation Power Analysis Side Channel Attack," MEng ECE, Virginia Tech, 2015
5. James Massey, "Implementation of a Software-Based GPS Receiver," MEng ECE, Virginia Tech, 2014

6. John Narayan, "Mitigating Effects of Bit Errors on Block Cipher Encrypted Wireless Data Links," MEng ECE, Virginia Tech, 2013
7. Peter Nguyen, "Implementation of an Open Source LTE eNodeB," MEng ECE, Virginia Tech, 2016
8. Kruti Pandya, "Survey of Different Dirty Paper Coding Methods," MEng ECE, Virginia Tech, 2013
9. Tejas Patel, "MaxWell Lab – Over-the-Air Testbed for IEEE 802.16e," MS Telecommunications, University of Maryland, 2008
10. Casandra Robinson, "Security in Autonomy: A Review of Security Considerations in Autonomous Systems," MEng ECE, Virginia Tech, 2017
11. Ruth Stoehr-Filipiak, "Algorithm and Performance Comparison of Convolutional Turbo Codes and Low-Density Parity Check Codes," MEng ECE, Virginia Tech, 2016

## Publication Summary

### Statistics on Publications

5	Books
54	Journal Papers
137	Conference Papers
5200+	Total Citations
36	H-Index
96	i10-Index

## Books

### Published Monographs

1. A. Khawar, A. Abdelhadi, T. Clancy, *Spectrum Sharing between Radars and Communication Systems*, Springer, 102 pages, 2017
2. M. Ghorbanzadeh, A. Abdelhadi, T. Clancy, *Cellular Communications Systems in Congested Environments: Resource Allocation and End-to-End Quality of Service*, Springer, 247 pages, 2017
3. A. Khawar, A. Abdelhadi, T. Clancy, *MIMO Radar Waveform Design for Spectrum Sharing with Cellular Systems: A MATLAB Based Approach*, Springer, 59 pages, 2016

### Monographs in Press

1. H. Shajaiah, A. Abdelhadi, T. Clancy, *Resource Allocation with Carrier Aggregation in Cellular Networks: Optimality and Spectrum Sharing*, Springer, in press
2. A. Kumar, A. Abdelhadi, T. Clancy, *Design and Implementation of Practical Schedulers for M2M Uplink Networks Using MATLAB*, Springer, in press

### Book Chapters

1. A. Abdelhadi, T. Clancy, "Application-Aware Spectrum Sharing," in *Handbook of Cognitive Radio*, Springer, available online, 2017

## Journal Papers

### Under Submission

1. T. O'Shea, T. Clancy, K. Karra, "Radio Modulation Recognition Using Neural Networks Based Feature Learning," *Springer Neural Computing and Applications Journal*, under submission
2. A. Khawar, A. Abdelhadi, T. Clancy, "MIMO Radar and Cellular System Spatial Coexistence using Channel Modeling," *IEEE Communications Letters*, under submission

3. A. Khawar, A. Abdelhadi, T. Clancy, "3D Channel Modeling between Seaborne MIMO Radar and MIMO Cellular System," *IEEE Antennas and Wireless Propagation Letters*, under submission
4. J. Mahal, A. Khawar, A. Abdelhadi, T. Clancy, "Radar Precoder Design for Spectral Coexistence with Coordinated Multi-point (CoMP) System," *IEEE Transactions on Aerospace and Electronic Systems*, under submission
5. A. Kumar, A. Abdelhadi, T. Clancy, "A Delay Optimal Multiclass Packet Scheduler for Generic M2M Uplink," *IEEE Internet of Things Journal*, under submission
6. A. Sengupta, S. Amuru, R. Tandon, R. Buehrer, T. Clancy, "Learning-Aided Collaborative Caching in Small Cell Networks," *IEEE/ACM Transactions on Networking*, under submission
7. W. Sehery, T. Clancy, "Flow Optimization in Data Centers with Clos Networks in Support of Cloud Applications," *IEEE Transactions on Network and Service Management*, under submission
8. A. Abed, T. Clancy, "Resilient Intrusion Detection System for Cloud Containers," *Elsevier Computers and Electrical Engineering*, under submission
9. T. O'Shea, T. Clancy, "Deep Learning and Data-Centric Approaches to Wireless Signal Processing Systems," *IEEE Wireless Communications*, under submission

#### **Published or Accepted for Publication**

1. H. Shajaiah, A. Abdelhadi, T. Clancy, "Robust Resource Allocation with Joint Carrier Aggregation for Spectrum Sharing in Multi-Carrier Cellular Networks," *IEEE Transactions on Cognitive Communications and Networking*, to appear
2. M. Lichtman, M. Vondal, T. Clancy, J. Reed, "Antifragile Communications," *IEEE Systems Journal*, available online
3. M. Ghorbanzadeh, A. Abdelhadi, T. Clancy, "Application-Aware Resource Allocation of Hybrid Traffic in Cellular Networks," *IEEE Transactions on Cognitive Communications and Networking*, vol. 3, (2), pp. 226–241, June 2017
4. A. Kumar, R. Tandon, T. Clancy, "On the Latency and Energy Efficiency of Distributed Storage Systems," *IEEE Transactions on Cloud Computing*, vol. 5, (2), pp. 221–233, April 2017
5. J. Mahal, A. Khawar, A. Abdelhadi, T. Clancy, "Spectral Coexistence of MIMO Radar and MIMO Cellular System," *IEEE Transactions on Aerospace and Electronic Systems*, vol. 53, (2), pp. 655–668, April 2017
6. M. Lichtman, T. Clancy, J. Reed, "FSK-Based Reactive Jamming Piggybacking," *IEEE Communication Letters*, vol. 21, (1), pp. 68–71, January 2017
7. J. Mahal, T. Clancy, "The BER Analysis of OFDMA and SC-FDMA under Pilot-Assisted Channel Estimation and Pilot Jamming in Rayleigh Slow-Fading Channels," *Wiley Wireless Communications and Mobile Computing*, vol. 16, (15), pp. 2315–2328, October 2016
8. C. Shahriar, T. Clancy, R. McGwier, "Equalization Attacks against OFDM: Analysis and Countermeasures," *Wiley Wireless Communications and Mobile Computing*, vol. 16, (13), pp. 1809–1825, September 2016
9. M. Ghorbanzadeh, E. Visotski, W. Yang, P. Moorut, T. Clancy, "Radar Interference into LTE Base Stations in the 3.5 GHz Band," *Elsevier Physical Communications*, vol. 20, pp. 33–47, September 2016

10. R. Tandon, S. Amuru, T. Clancy, R. Buehrer, "Towards Optimal Secure Distributed Storage Systems with Exact Repair," *IEEE Transactions on Information Theory*, vol. 62, (6), pp. 3477-3492, June 2016
11. A. Khawar, A. Abdelhadi, T. Clancy, "Coexistence Analysis between Radar and Cellular System in LoS Channel," *IEEE Antennas and Wireless Propagation Letters*, vol. 15, pp. 972-975, March 2016
12. M. La Pan, T. Clancy, R. McGwier, "Physical Layer OFDM Acquisition and Timing Synchronization Security," *Wiley Wireless Communications and Mobile Computing*, vol. 16, (2), pp. 177-191, February 2016
13. H. Shajaiah, A. Abdelhadi, T. Clancy, "Towards an Application-Aware Resource Scheduling with Carrier Aggregation in Cellular Systems," *IEEE Communication Letters*, vol. 20, (1), pp. 129-132, January 2016
14. M. Lichtman, J. Poston, S. Amuru, C. Shahriar, T. Clancy, R. Buehrer, J. Reed, "A Communications Jamming Taxonomy," *IEEE Security and Privacy*, vol. 14, (1), pp. 47-54, January 2016
15. H. Shajaiah, A. Abdelhadi, T. Clancy, "An Efficient Multi-Carrier Resource Allocation with User Discrimination Framework for 5G Wireless Systems," *Springer International Journal of Wireless Information Networks*, vol. 22, (4), pp. 345-356, December 2015
16. A. Abdelhadi, A. Khawar, T. Clancy, "Optimal Downlink Power Allocation in Cellular Networks," *Elsevier Physical Communication*, vol. 17, pp. 1-14, December 2015
17. A. Khawar, A. Abdelhadi, T. Clancy, "QPSK Waveform for MIMO Radar with Spectrum Sharing Constraints," *Elsevier Physical Communication*, vol. 17, pp. 37-57, December 2015
18. J. Narayan, S. Shukla, T. Clancy, "A Survey of Automatic Protocol Reverse Engineering Tools," *ACM Computing Surveys*, vol. 48, (3), December 2015
19. A. Kumar, A. Sengupta, R. Tandon, T. Clancy, "Dynamic Resource Allocation for Cooperative Spectrum Sharing in LTE Networks," *IEEE Transactions on Vehicular Technology*, vol. 64, (11), pp. 5232-5245, November 2015
20. A. Khawar, A. Abdelhadi, T. Clancy, "Target Detection Performance of Spectrum Sharing MIMO Radars," *IEEE Sensors Journal*, vol. 15, (9), pp. 4928-4940, September 2015
21. A. Abdelhadi, H. Shajaiah, T. Clancy, "A Multi-Tier Wireless Spectrum Sharing System Leveraging Secure Spectrum Auctions," *IEEE Transactions on Cognitive Communications and Networks*, vol. 1, (2), pp. 217-229, June 2015
22. C. Shahriar, M. La Pan, M. Lichtman, T. Clancy, R. McGwier, R. Tandon, S. Sodagari, J. Reed, "PHY-Layer Resiliency in OFDM Communications: A Tutorial," *IEEE Communications Surveys & Tutorials*, vol. 17, (1), pp. 292-314, March 2015
23. S. Sodagari, T. Clancy, "On Singularity Attacks in MIMO Channels," *Wiley Transactions on Emerging Telecommunication Technologies*, vol. 26, (3), pp. 482-490, March 2015
24. A. Sengupta, R. Tandon, T. Clancy, "Fundamental Limits on Caching with Secure Delivery," *IEEE Transactions on Information Forensics and Security*, vol. 10, (2), February 2015
25. S. Amuru, R. Tandon, R. Buehrer, T. Clancy, "Retroactive Anti-Jamming for MISO Broadcast Channels," *IEEE Transactions on Information Theory*, vol. 60, (6), pp. 3593-3619, June 2014

26. J. Mitola, J. Guerci, J. Reed, Y. Yao, T. Clancy, Y. Chen, Y. Guo, H. Li, H. Man, R. McGwier, "Accelerating 5G QoE via Public-Private Spectrum Sharing," *IEEE Communications Magazine*, vol. 52, (5), pp. 77-85, May 2014
27. J. Park, J. Reed, A. Beex, T. Clancy, V. Kumar, B. Bahrak, "Security and Enforcement in Spectrum Sharing," *Proceedings of the IEEE*, vol. 102, (3), pp. 270-281, March 2014
28. G. Zaki, W. Plishker, S. Bhattacharyya, T. Clancy, J. Kuykendall, "Integration of Dataflow-based Heterogeneous Multiprocessor Scheduling Techniques in GNU Radio," *Journal of Signal Processing Systems*, Springer, vol. 70, (2), pp. 177-191, February 2013
29. J. Goodman, K. Rudd, T. Clancy, "Blind Multiuser Localization in Cognitive Radio Networks," *IEEE Communications Letters*, vol. 16, (7), pp. 1018-1021, July 2012
30. Y. Wu, B. Wang, R. Liu, T. Clancy, "Anti-Jamming Games in Multi-Channel Cognitive Radio Networks," *IEEE Journal on Selected Areas in Communications*, vol. 30, (1), pp. 4-15, January 2012
31. N. Goergen, W. Lin, R. Liu, T. Clancy, "Extrinsic Channel-Like Fingerprint Embedding for Authenticating MIMO Systems," *IEEE Transactions on Wireless Communications*, vol. 10, (12), pp 4270-4281, December 2011
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33. N. Goergen, R. Liu, T. Clancy, "Best Effort Cooperative Relaying," *IEEE Transactions on Wireless Communications*, vol. 10, (6), pp. 1833-1843, June 2011
34. T. Clancy, A. Khawar, T. Newman, "Robust Signal Classification using Unsupervised Learning," *IEEE Transactions on Wireless Communications*, vol. 10, (4), pp. 1289-1299, April 2011
35. B. Wang, Y. Wu, R. Liu, T. Clancy, "An Anti-Jamming Stochastic Game for Cognitive Radio Networks," *IEEE Journal on Selected Areas in Communications*, vol. 29, (4), pp. 877-889, April 2011
36. B. Wang, R. Liu, T. Clancy, "Evolutionary Cooperative Spectrum Sensing Game: How to Collaborate?," *IEEE Transactions on Communications*, vol. 58, (3), pp. 890-900, March 2010
37. Y. Wu, B. Wang, R. Liu, T. Clancy, "A Scalable Collusion-Resistant Multi-Winner Cognitive Spectrum Auction Game," *IEEE Transactions on Communications*, vol. 57, (12), pp. 3805-3816, December 2009
38. T. Clancy, "On the Use of Interference Temperature for Dynamic Spectrum Access," *Annals of Telecommunications*, Springer, vol. 64, (7), pp. 573-585, August 2009
39. B. Wang, Z. Ji, M. Abdulrehem, R. Liu, T. Clancy, "Primary-Prioritized Markov Approach for Dynamic Spectrum Allocation," *IEEE Transactions on Wireless Communications*, vol. 8, (4), pp. 1854-1865, April 2009
40. Y. Wu, B. Wang, R. Liu, T. Clancy, "Repeated Open Spectrum Sharing Game with Cheat-Proof Strategies," *IEEE Transactions on Wireless Communications*, vol. 8, (4), pp. 1922-1933, April 2009
41. B. Wang, Y. Wu, Z. Ji, R. Liu, T. Clancy, "Game Theoretical Mechanism Design for Cognitive Radio Networks with Selfish Users," *IEEE Signal Processing Magazine*, vol. 25, (6), pp. 74-84, November 2008
42. T. Clancy, "Secure Handover in Enterprise WLANs: CAPWAP, HOKEY, and 802.11r," *IEEE Wireless Communications*, vol. 15, (5), pp. 80-85, October 2008

## Conference Papers

43. T. Clancy, "Formalizing the Interference Temperature Model," *Wiley Journal on Wireless Communications and Mobile Computing*, vol. 7, (9), pp. 1077–1086, November 2007
44. T. Clancy, J. Hecker, T. O'Shea, E. Stuntebeck, "Applications of Machine Learning to Cognitive Radio Networks," *IEEE Wireless Communications*, vol. 14, (4), pp. 47–52, August 2007
45. A. Mishra, M. Shin, N. Petroni, T. Clancy, W. Arbaugh, "Proactive Key Distribution using Neighbor Graphs," *IEEE Wireless Communications*, vol. 11, (1), pp. 26–36, February 2004

## Under Submission

1. A. Abed, T. Clancy, "Intrusion Detection System for Cloud Containers," *IEEE Global Communications Conference (GLOBECOM)*, under submission
2. J. Mahal, T. Clancy, "Jammer Blind Estimation of a Third-Party OFDM Channel," *IEEE Global Communications Conference (GLOBECOM)*, under submission
3. T. O'Shea, T. Erpek, T. Clancy, "Learning to Encode Information for the Wireless Multi-Antenna Channel," *IEEE Conference on Signals, Systems and Computers (Asilomar)*, under submission
4. T. O'Shea, T. Roy, T. Clancy, "Learning Robust General Radio Signal Detection using Computer Vision Methods," *IEEE Conference on Signals, Systems and Computers (Asilomar)*, under submission
5. T. O'Shea, K. Karra, T. Clancy, "Learning Approximate Neural Estimators for Wireless Channel State Estimation," *IEEE International Workshop on Machine Learning for Signal Processing (MLSP)*, under submission

## Published or Accepted for Publication

1. T. O'Shea, K. Karra, T. Clancy, "Learning to Communicate: Channel Auto-encoders, Domain Specific Regularizers, and Attention," *IEEE International Symposium on Signal Processing and Information Technology (ISSPIT)*, December 2016
2. A. Kumar, A. Abdelhadi, T. Clancy, "A Delay Efficient MAC and Packet Scheduler for Heterogeneous M2M Uplink," *IEEE Global Communications Conference (GLOBECOM)*, December 2016
3. A. Sengupta, R. Tandon, T. Clancy, "Layered Caching for Heterogeneous Storage," *IEEE Conference on Signals, Systems and Computers (Asilomar)*, November 2016
4. T. O'Shea, L. Pemula, D. Bhatra, T. Clancy, "Radio Transformer Networks: Attention Models for Learning to Synchronize in Wireless Systems," *IEEE Conference on Signals, Systems and Computers (Asilomar)*, November 2016
5. H. Shajaiah, J. Mahal, T. Clancy, "Resource Management with Anti-Jamming Capability for Cognitive Space Communication Systems," *IEEE Military Communications Conference (MILCOM)*, November 2016
6. J. Narayan, T. Clancy, "A Hidden Markov Model Approach for Automatic Closed Protocol Hop Synchronization," *IEEE Military Communications Conference (MILCOM)*, November 2016
7. A. Kumar, A. Abdelhadi, T. Clancy, "A Delay Efficient Multiclass Packet Scheduler for Heterogeneous M2M Uplink," *IEEE Military Communications Conference (MILCOM)*, November 2016
8. A. Kumar, A. Abdelhadi, T. Clancy, "A Delay-Optimal Packet Scheduler for M2M Uplink," *IEEE Military Communications Conference (MILCOM)*, November 2016

9. M. Lichtman, J. Reed, T. Clancy, "Reactive Jammer Piggybacking: Achieving Antifragile Electronic Warfare," IEEE Military Communications Conference (MILCOM), November 2016
10. S. Hitefield, T. Clancy, "Flowgraph Acceleration with GPUs: Analyzing the Benefits of Custom Buffers in GNU Radio," Proceedings of the GNU Radio Conference (GRcon), September 2016
11. T. O'Shea, J. Corgan, T. Clancy, "Convolutional Radio Modulation Recognition Networks," International Conference on Engineering Applications of Neural Networks, September 2016
12. T. O'Shea, J. Corgan, T. Clancy, "Unsupervised Representation Learning of Structured Radio Communication Signals," IEEE International Workshop on Sensing Processing and Learning for Intelligent Machines (SPLINE), July 2016
13. T. Erpek, A. Abdelhadi, T. Clancy, "An Application-Aware Resource Block and Power Allocation for LTE," IEEE Systems Conference, April 2016
14. A. Kumar, A. Abdelhadi, T. Clancy, "An Online Delay Efficient Packet Scheduler for M2M Traffic in Industrial Automation," IEEE Systems Conference, April 2016
15. Y. Wang, A. Abdelhadi, T. Clancy, "Optimal Power Allocation for LTE Users with Different Modulations," IEEE Systems Conference, April 2016
16. H. Shajaiah, A. Abdelhadi, T. Clancy, "An Application-Aware Spectrum Sharing Approach for Commercial Use of 3.5 GHz Spectrum," IEEE Systems Conference, April 2016
17. A. Abdelhadi, F. Rechia, A. Narayanan, T. Teixeira, R. Lent, D. Benhaddou, H. Lee, T. Clancy, "Position Estimation of Robotic Mobile Nodes in Wireless Testbed using GENI," IEEE Systems Conference, April 2016
18. A. Abdelhadi, T. Clancy, "Network MIMO with Partial Cooperation between Radar and Cellular Systems," IEEE International Conference on Computing, Networking and Communications (ICNC), February 2016
19. A. Abdelhadi, T. Clancy, "Optimal Context-Aware Resource Allocation in Cellular Networks," IEEE International Conference on Computing, Networking and Communications (ICNC), February 2016
20. A. Abdelhadi, T. Clancy, "An Optimal Resource Allocation with Frequency Reuse in Cellular Networks," IEEE International Conference on Computing, Networking and Communications (ICNC), February 2016
21. A. Abed, T. Clancy, D. Levy, "Applying Bag of System Calls for Anomaly Detection in Linux Containers," IEEE Global Communications Conference (GLOBECOM), December 2015
22. M. Bari, A. Khawar, M. Doroslovacki, T. Clancy, "Recognizing FM, BPSK and 16-QAM using Supervised and Unsupervised Learning Techniques," IEEE Conference on Signals, Systems and Computers (Asilomar), November 2015
23. J. Mahal, C. Shahriar, T. Clancy, "Jamming and Nulling Attacks on Cyclic Prefix of SC-FDMA and Two Novel Countermeasures," IEEE Military Communications Conference (MILCOM), October 2015
24. M. Fowler, A. O'Donnell, D. DePoy, T. Clancy, "A Cognitive Subsystem for the Optimization of Radar Doctrine for Radar/Comms Coexistence," IEEE Military Communications Conference (MILCOM), October 2015
25. A. Abed, T. Clancy, D. Levy, "Intrusion Detection System for Applications using Linux Containers," European Symposium on Research in Computer Security, September 2015

26. A. Sengupta, R. Tandon, T. Clancy, "Improved Approximation of Storage-Rate Trade-off for Caching via New Outer Bounds," IEEE International Symposium on Information Theory (ISIT), June 2015
27. H. Shajaiah, A. Abdelhadi, T. Clancy, "Spectrum Sharing Approach between Radar and Communication Systems and its Impact on Radar's Detectable Target Parameters," IEEE Vehicular Technology Conference (VTC), May 2015
28. W. Sehery, T. Clancy, "Load Balancing in Data Center Networks with Folded-Clos Architectures," IEEE NetSoft Workshop on Management Issues in SDN and NFV, April 2015
29. H. Shajaiah, A. Abdelhadi, T. Clancy, "A Price Selective Centralized Algorithm for Resource Allocation with Carrier Aggregation in LTE Cellular Networks," IEEE Wireless Communications and Networking Conference (WCNC), March 2015
30. C. Shahriar, A. Abdelhadi, T. Clancy, "Overlapped-MIMO Radar Waveform Design for Coexistence with Communication Systems," IEEE Wireless Communications and Networking Conference (WCNC), March 2015
31. M. Ghorbanzadeh, E. Visotsky, P. Moorut, W. Yang, T. Clancy, "Radar In-band and Out-of-Band Interference into LTE Macro and Small Cell Uplinks in the 3.5 GHz Band," IEEE Wireless Communications and Networking Conference (WCNC), March 2015
32. M. Ghorbanzadeh, A. Abdelhadi, T. Clancy, "A Utility Proportional Fairness Radio Resource Block Allocation in Cellular Networks," IEEE International Conference on Computing, Networking and Communications (ICNC), February 2015
33. A. Abdelhadi, T. Clancy, "An Optimal Resource Allocation with Joint Carrier Aggregation in 4G-LTE," IEEE International Conference on Computing, Networking and Communications (ICNC), February 2015
34. M. Ghorbanzadeh, E. Visotsky, P. Moorut, W. Yang, T. Clancy, "Radar in-Band Interference Effects on Macrocell LTE Uplink Deployments in the U.S. 3.5 GHz Band," IEEE International Conference on Computing, Networking and Communications (ICNC), February 2015
35. M. Ghorbanzadeh, A. Abdelhadi, A. Amanna, J. Dwyer, T. Clancy, "Implementing an Optimal Rate Allocation Tuned to the User Quality of Experience," IEEE International Conference on Computing, Networking and Communications (ICNC), February 2015
36. A. Kumar, R. Tandon, T. Clancy, "On the Latency of Heterogeneous MDS Queue," IEEE Global Communications Conference (GLOBECOM), December 2014
37. M. La Pan, T. Clancy, R. McGwier, "A Machine Learning Approach for Dynamic Spectrum Access Radio Identification," IEEE Global Communications Conference (GLOBECOM), December 2014
38. J. Tate, T. Clancy, "Secure and Tamper Proof Code Management," ACM CCS Workshop on Cyber Security Analytics and Automation (SafeConfig), November 2014
39. M. Ghorbanzadeh, A. Abdelhadi, T. Clancy, "A Utility Proportional Fairness Resource Allocation in Spectrally Radar-Coexistent Cellular Networks," IEEE Military Communications Conference (MILCOM), October 2014
40. C. Shahriar, C. Cole, T. Clancy, "Performance Impact of Imperfect CSI on Spatial Hiding Anti-Jam Communications," IEEE Military Communications Conference (MILCOM), October 2014
41. C. Cole, C. Shahriar, T. Clancy, "An Anti-jam Communications Technique via Spatial Hiding Precoding," IEEE Military Communications Conference (MILCOM), October 2014



42. A. Khawar, A. Abdelhadi, T. Clancy, "On The Impact of Time-Varying Interference-Channel on the Spatial Approach of Spectrum Sharing between S-band Radar and Communication System," IEEE Military Communications Conference (MILCOM), October 2014
43. M. La Pan, T. Clancy, R. McGwier, "An Assessment of OFDM Carrier Frequency Offset Synchronization Security for 4G Systems," IEEE Military Communications Conference (MILCOM), October 2014
44. M. Lichtman, J. Peck, V. Arellano, J. Reed, T. Clancy, "An Electronic Warfare Perspective of LTE," IEEE Military Communications Conference (MILCOM), October 2014
45. S. Hitefield, M. Fowler, C. Jennette, T. Clancy, "Link Hijacking through Wireless Exploitation of a Vulnerable Software Defined Waveform," IEEE Military Communications Conference (MILCOM), October 2014
46. H. Shajaiah, A. Abdelhadi, T. Clancy, "Multi-Application Resource Allocation with Users Discrimination in Cellular Networks," IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC), September 2014
47. A. Sengupta, R. Tandon, T. Clancy, "Decentralized Caching with Secure Delivery," IEEE International Symposium on Information Theory (ISIT), July 2014
48. A. Sengupta, R. Tandon, T. Clancy, "Fundamental Limits of Caching with Secure Delivery," IEEE ICC Workshop on Wireless Physical Layer Security, June 2014
49. J. Mahal, T. Clancy, "The Closed-form BER Expressions of PSK Modulation for OFDM and SC-FDMA under Jamming and Imperfect Channel Estimation," IEEE International Conference on Communications (ICC), June 2014
50. R. Tandon, S. Amuru, T. Clancy, R. Buehrer, "Optimal Secure (3; 2; 2) and (4; 3; 3) Distributed Storage Systems with Exact Repair," IEEE International Conference on Communications (ICC), June 2014
51. Y. Chen, M. Ghorbanzadeh, K. Ma, T. Clancy, R. McGwier, "A Hidden Markov Model Detection of Malicious Android Applications at Runtime," IEEE Wireless & Optical Communications Conference (WOCC), May 2014
52. A. Sengupta, R. Tandon, T. Clancy, "Secure Caching with Non-Uniform Demands," IEEE Global Wireless Summit (GWS), May 2014
53. A. Khawar, A. Abdelhadi, T. Clancy, "A Mathematical Analysis of Cellular Interference on the Performance of S-band Military Radar Systems," IEEE Wireless Telecommunications Symposium (WTS), April 2014
54. A. Khawar, A. Abdelhadi, T. Clancy, "Spectrum Sharing between S-band Radar and LTE Cellular System: A Spatial Approach," IEEE DySPAN Workshop on Shared Spectrum Access for Radar and Communications (SSPARC) Technologies, April 2014
55. A. Khawar, A. Abdelhadi, T. Clancy, "MIMO Radar Waveform Design for Coexistence with Cellular Systems," IEEE DySPAN Workshop on Shared Spectrum Access for Radar and Communications (SSPARC) Technologies, April 2014
56. H. Shajaiah, A. Khawar, A. Abdelhadi, T. Clancy, "Resource Allocation with Carrier Aggregation in LTE Advanced Cellular System Sharing Spectrum with S-band Radar," IEEE DySPAN Workshop on Shared Spectrum Access for Radar and Communications (SSPARC) Technologies, April 2014
57. A. Abdelhadi, T. Clancy, "A Utility Proportional Fairness Approach for Resource Allocation in 4G-LTE," IEEE International Conference on Computing, Networking, and Communications (ICNC), February 2014
58. V. Kumar, J. Park, T. Clancy, K. Bian, "PHY-Layer Authentication Using Hierarchical Modulation and Duobinary Signaling," IEEE International Conference on Computing, Networking, and Communications (ICNC), February 2014

59. H. Shajaiah, A. Abdelhadi, T. Clancy, "Spectrum Sharing between Public Safety and Commercial Users in 4G-LTE," IEEE International Conference on Computing, Networking, and Communications (ICNC), February 2014
60. A. Khawar, A. Abdelhadi, T. Clancy, "Beampattern Analysis for MIMO Radar and Telecommunication System Coexistence," IEEE International Conference on Computing, Networking, and Communications (ICNC), February 2014
61. S. Amuru, R. Tandon, R. Buehrer, T. Clancy, "Jamming Countermeasures for Multi-User MISO Broadcast Channels: A DoF Perspective," IEEE Global Communications Conference (GLOBECOM), December 2013
62. H. Shajaiah, A. Abdelhadi, T. Clancy, "Utility Proportional Fairness Resource Allocation with Carrier Aggregation in 4G-LTE," IEEE Military Communications Conference (MILCOM), November 2013
63. S. Amuru, R. Tandon, R. Buehrer, T. Clancy, "Interference Alignment for MISO Broadcast Channels under Jamming attacks," IEEE Conference on Signals, Systems, and Computers (Asilomar), November 2013
64. A. Abdelhadi, T. Clancy, "A Resource Allocation Algorithm for Multi-Application Users in 4G-LTE," ACM MOBICOM Workshop on Cognitive Radio Architectures for Broadband (CRAB), October 2013
65. V. Kumar, J. Park, T. Clancy, K. Bian, "PHY-Layer Authentication by Introducing Controlled Inter Symbol Interference," IEEE Conference on Communications and Network Security (CNS), October 2013
66. A. Abdelhadi, T. Clancy, "A Robust Optimal Rate Allocation Algorithm and Pricing Policy for Hybrid Traffic in 4G-LTE," IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC), September 2013
67. M. Ghorbanzadeh, Y. Chen, T. Clancy, R. McGwier, "Fine-Grained End-to-End Network Model via Vector Quantization and Hidden Markov Processes," IEEE International Conference on Communications (ICC), June 2013
68. C. Shahriar, S. Sodagari, R. McGwier, T. Clancy, "Performance Impact of Asynchronous Off-tone Jamming Attacks Against OFDM," IEEE International Conference on Communications (ICC), June 2013
69. M. La Pan, T. Clancy, R. McGwier, "Phase Warping and Differential Scrambling Attacks against OFDM Frequency Synchronization," IEEE International Conference on Acoustics Speed and Signal Processing (ICASSP), May 2013
70. C. Shahriar, R. McGwier, T. Clancy, "Performance Impact of Pilot Tone Randomization to Mitigate OFDM Jamming Attacks," IEEE Consumer Communications and Networking Conference (CCNC), January 2013
71. M. Ghorbanzadeh, Y. Chen, K. Ma, T. Clancy, R. McGwier, "A Neural Network Approach to Category Validation of Android Applications," IEEE International Conference on Computing, Networking and Communications (ICNC), January 2013
72. Y. Chen, F. Chen, J. Dai, T. Clancy, "Student-T Based Robust Spatio-Temporal Prediction," IEEE International Conference on Data Mining (ICDM), December 2012
73. S. Sodagari, A. Khawar, T. Clancy, R. McGwier, "A Projection-Based Approach for Radar and Telecommunication Systems Coexistence," IEEE Global Conference on Communications (GLOBECOM), December 2012
74. S. Cannon, Y. Shlyak, F. Perich, M. McHenry, M. Lerch, R. McGwier, T. Clancy, "Detecting and Mitigating Primary User Emulation Attacks against DSA," IEEE Military Communications Conference (MILCOM), October 2012

75. M. La Pan, T. Clancy, R. McGwier, "Jamming Attacks against OFDM Timing Synchronization and Signal Acquisition," IEEE Military Communications Conference (MILCOM), October 2012
76. T. Tsou, T. Cooper, R. McGwier, T. Clancy, J. Reed, "Development of an Open-Source GSM Femtocell and Integrated Core Infrastructure," IEEE Military Communications Conference (MILCOM), October 2012
77. S. Sodagari, T. Clancy, "Efficient Jamming Attacks on MIMO Channels," IEEE International Conference on Communications (ICC), June 2012
78. C. Shahriar, S. Sodagari, T. Clancy, "Performance of Pilot Jamming on MIMO Channels with Imperfect Synchronization," IEEE International Conference on Communications (ICC), June 2012
79. S. Sodagari, T. Clancy, "An Anti-Jamming Strategy for Channel Access in Cognitive Radio Networks," Conference on Decision and Game Theory for Security (GameSec), November 2011
80. G. Zaki, W. Plishker, S. Bhattacharyya, T. Clancy, J. Kuykendall, "Vectorization and Mapping of Software Defined Radio Applications on Heterogeneous Multi-Processor Platforms," IEEE Workshop on Signal Processing Systems (SiPS), October, 2011
81. T. Clancy, "Efficient OFDM Denial: Pilot Jamming and Pilot Nulling," IEEE International Conference on Communications (ICC), June 2011
82. W. Plishker, G. Zaki, S. Bhattacharyya, T. Clancy, J. Kuykendall, "Applying Graphics Processor Acceleration in a Software Defined Radio Prototyping Environment," IEEE International Symposium on Rapid System Prototyping (RSP), May 2011
83. N. Goergen, W. Lin, R. Liu, T. Clancy, "Channel-Like Fingerprinting Overlays for Authenticating OFDM Signals Using Channel Side Information," APSIPA Annual Summit and Conference, December 2010
84. N. Goergen, W. Lin, R. Liu, T. Clancy, "Authenticating MIMO Transmissions Using Channel-Like Fingerprinting," IEEE Global Communications Conference (GLOBECOM), December 2010
85. T. Newman, T. Clancy, M. McHenry, J. Reed, "Case Study: Security Analysis of a Dynamic Spectrum Access Radio System," IEEE Global Communications Conference (GLOBECOM), December 2010
86. N. Goergen, T. Clancy, T. Newman, "Physical Layer Authentication Watermarks Through Synthetic Channel Emulation," IEEE Dynamic Spectrum Access Networks Conference (DySPAN), April 2010
87. N. Goergen, R. Liu, T. Clancy, "Best Effort Cooperative Communication using Non-Dedicated Relays," IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), March 2010
88. T. Clancy, T. OShea, "TRANSEC Mitigation Options for Wireless Metropolitan Area Networks," IEEE Military Communications Conference (MILCOM), December 2009
89. A. Khawar, T. Clancy, "Signal Classifiers using Self-Organizing Maps: Performance and Robustness," SDR Forum Technical Conference (SDR), November 2009
90. T. Clancy, A. Burnette, A. Agrawala, "MAXWell Lab: Building a WiMAX Forum Applications Laboratory," IEEE Mobile WiMAX Symposium, July 2009
91. T. Clancy, A. Khawar, "Security Threats to Signal Classifiers Using Self-Organizing Maps," International Conference on Cognitive Radio Oriented Wireless Networks and Communications (CrownCom), June 2009
92. T. Newman, T. Clancy, "Security Threats to Cognitive Radio Signal Classifiers," Virginia Tech Wireless Personal Communications Symposium, June 2009

93. T. Clancy, K. Hoepfer, "Making the Case for EAP Channel Bindings," IEEE Sarnoff Symposium, March 2009
94. B. Wang, R. Liu, T. Clancy, "Evolutionary Game Framework for Behavior Dynamics in Cognitive Radio Networks," IEEE Global Communications Conference (GLOBECOM), December 2008
95. Y. Wu, B. Wang, R. Liu, T. Clancy, "Collusion-Resistant Multi-Winner Spectrum Auction for Cognitive Radio Networks," IEEE Global Communications Conference (GLOBECOM), December 2008
96. T. Clancy, R. McGwier, T. OShea, "On the Capacity of the Third-Party MIMO Receiver Channel," IEEE Military Communications Conference (MILCOM), November 2008
97. B. Walker, T. Clancy, J. Glenn, "Using Localized Random Walks to Model Delay-Tolerant Protocols," IEEE Military Communications Conference (MILCOM), November 2008
98. W. Lin, R. Liu, T. Clancy, "Modulation Forensics for Space Time Coding in Wireless Communications," SDR Forum Technical Conference (SDR), October 2008
99. Y. Wu, B. Wang, R. Liu, T. Clancy, "A Multi-Winner Cognitive Spectrum Auction Framework with Collusion-Resistant Mechanisms," IEEE Dynamic Spectrum Access Networks Conference (DySPAN), October 2008
100. M. Seligman, B. Walker, T. Clancy, "Delay-Tolerant Network Experiments of the MeshTest Wireless Testbed," ACM MobiCOM Challenged Networks Workshop (CHANTS), pp. 49–56, September 2008
101. A. Mills, B. Smith, T. Clancy, E. Soljanin, S. Vishwanath, "On Secure Communication over Wireless Erasure Networks," IEEE International Symposium on Information Theory (ISIT), pp. 161–165, July 2008
102. N. McCarthy, E. Blossom, N. Goergen, T. OShea, T. Clancy, "High-Performance SDR: GNU Radio and the IBM Cell Broadband Engine," Virginia Tech Wireless Personal Communications Symposium, June 2008
103. T. Clancy, N. Goergen, "Security in Cognitive Radio Networks: Threats and Mitigation," International Conference on Cognitive Radio Oriented Wireless Networks and Communications (CrownCom), May 2008
104. A. Soysal, S. Ulukus, T. Clancy, "Channel Estimation and Adaptive M-QAM in Cognitive Radio Links," IEEE International Conference on Communications (ICC), pp. 4043–4047, May 2008
105. B. Walker, T. Clancy, "A Quantitative Evaluation of the MeshTest Wireless Testbed," IEEE Conference on Testbeds and Research Infrastructures (TridentCom), March 2008
106. T. OShea, T. Clancy, H. Ebeid, "Practical Signal Detection and Classification in GNU Radio," SDR Forum Technical Conference (SDR), November 2007
107. T. Clancy, Z. Ji, B. Wang, R. Liu, "Planning Approach to Dynamic Spectrum Access in Cognitive Radio Networks," IEEE Global Communications Conference (GLOBECOM), November 2007
108. B. Walker, J. Glenn, T. Clancy, "Analysis of Simple Counting Protocols for Delay-Tolerant Networks," ACM MobiCOM Challenged Networks Workshop (CHANTS), pp. 19–26, September 2007
109. T. Clancy, "Dynamic Spectrum Access: The Capacity versus Complexity Tradeoff," Virginia Tech Symposium on Wireless Personal Communications, June 2007
110. T. Clancy, B. Walker, "MeshTest: Laboratory-Based Testbed for Large Wireless Topologies," IEEE Conference on Testbeds and Research Infrastructure (TridentCom), May 2007

111. T. Clancy, "Achievable Capacity under the Interference Temperature Model," IEEE Conference on Computer Communications (INFOCOM), pp. 794–802, May 2007
112. E. Stuntebeck, T. OShea, J. Hecker, T. Clancy, "Architecture for an Open-Source Cognitive Radio," SDR Forum Technical Conference (SDR), November 2006
113. T. Clancy, B. Walker, "Spectrum Shaping for Interference Management in Cognitive Radio Networks," SDR Forum Technical Conference (SDR), November 2006
114. T. Clancy, B. Walker, "Predictive Dynamic Spectrum Access," SDR Forum Technical Conference (SDR), November 2006
115. T. Clancy, W. Arbaugh, "Measuring Interference Temperature," Virginia Tech Symposium on Wireless Personal Communications, June 2006
116. T. Clancy, N. Kiyavash, D. Lin, "Secure Smartcard-Based Fingerprint Authentication," ACM SIGMM Workshop on Biometrics Methods and Applications (WBMA), pp 45–52, November 2003
117. N. Boston, T. Clancy, Y. Liow, J. Webster, "Genus Two Hyperelliptic Curve Coprocessor," Workshop on Cryptographic Hardware and Embedded Systems (CHES), Springer, LNCS vol. 2523, pp 400–414, August 2002
118. J. Predina, K. Gibbs, B. Dames, Z. Kissel, B. Brosmer, T. Clancy, K. Galamback, R. Smith, C. Zawistoski, "Use of Apodization to Improve the Quality of Radiometric Measurements from Interferometric Sounders," Twelfth International TOVS Study Conference, March 2002

#### **Invited Conference and Workshop Papers**

1. C. Carlson, V. Nguyen, S. Hitefield, T. OShea, T. Clancy, "Measuring Smart Jammer Strategy Efficacy Over the Air," IEEE CNS Workshop on Cognitive Radio and Electromagnetic Spectrum Security (CRESS), October 2014
2. S. Hitefield, V. Nguyen, C. Carlson, T. OShea, T. Clancy, "Demonstrated LLC-Layer Attack and Defense Strategies for Wireless Communication Systems," IEEE CNS Workshop on Cognitive Radio and Electromagnetic Spectrum Security (CRESS), October 2014
3. A. Sengupta, S. Amuru, R. Tandon, R. Buehrer, T. Clancy, "Learning Distributed Caching Strategies in Small Cell Networks," IEEE International Symposium on Wireless Communication Systems (ISWCS), August 2014
4. R. Tandon, S. Amuru, T. Clancy, R. Buehrer, "Distributed Storage Systems with Secure and Exact Repair - New Results," IEEE Information Theory and Applications (ITA), February 2014
5. M. Lichtman, J. Reed, M. Norton, T. Clancy, "Vulnerability of LTE to Hostile Interference," IEEE Global Conference on Signal and Information Processing (GlobalSIP), November 2013
6. T. Clancy, M. Norton, M. Lichtman, "Security Challenges with LTE-Advanced Systems and Military Spectrum," IEEE Military Communications Conference (MILCOM), November 2013
7. M. La Pan, M. Lichtman, T. Clancy, R. McGwier, "Protecting Physical Layer Synchronization: Mitigating Attacks against OFDM Acquisition," IEEE Global Wireless Summit (GWS), June 2013
8. T. Clancy, "Confluence of Electronic Warfare and Computer Network Attack," Emerging Technologies Conference, Lawrence Livermore National Labs, November 2011

9. C. Shahriar, S. Sodagari, T. Clancy, "Physical-Layer Security Challenges of DSA-Enabled TD-LTE," Conference on Cognitive Radio and Advanced Spectrum Management (CogArt), October 2011
10. S. Sodagari, T. Clancy, "Preemption, Fairness, and Security Dynamics in Heterogeneous DSA Environments," IEEE International Symposium on Personal, Indoor, and Mobile Radio Communications (PIMRC), September 2011
11. G. Zaki, W. Plishker, S. Bhattacharyya, E. Blossom, T. OShea, N. McCarthy, T. Clancy, "Integration of Dataflow Optimization Techniques into a Software Radio Design Framework," IEEE Conference on Signals, Systems, and Computers (Asilomar), November 2009
12. T. Clancy, M. Beecher, I. Vo, B. Walker, "A Demonstration of the MeshTest Wireless Testbed," IEEE Conference on Testbeds and Research Infrastructure (TridentCom), April 2009
13. T. Clancy, "Adaptation Overhead in Time-Varying Cognitive Radio Channels," IEEE CCNC Workshop on Cognitive Radio Networks (CRN), pp. 1009–1013, January 2008
14. T. Clancy, "FPGA-based Hyperelliptic Curve Cryptosystems," AMS Central Section Meeting, Special Session on Cryptography and Computational Number Theory, April 2003

## Technical Reports

### Technical Reports, Preprints, and Theses

1. A. Khawar, A. Abdelhadi, T. Clancy, "Shared Spectrum Access for MIMO Radar and MIMO Communications," Virginia Tech Hume Center Technical Report HC-R140013, September 2014
2. A. Khawar, A. Abdelhadi, T. Clancy, "On the Coherence Time of the Wireless Channel under Various Sea States," Virginia Tech Hume Center Technical Report HC-R140009, September 2014
3. A. Khawar, A. Abdelhadi, T. Clancy, "Performance of Spectrum Sharing MIMO Radars in LoS Channel Models," Virginia Tech Hume Center Technical Report HC-R140012, August 2014
4. A. Khawar, A. Abdelhadi, T. Clancy, "3D Channel Modeling between Radar and Communication Systems for Spectrum Sharing," Virginia Tech Hume Center Technical Report HC-R140011, August 2014
5. A. Khawar, A. Abdelhadi, T. Clancy, "Limits on Search/Track/Detect Volume Illuminated by Spectrum Sharing MIMO Radars," Virginia Tech Hume Center Technical Report HC-R140010, August 2014
6. A. Khawar, J. Mahal, A. Abdelhadi, T. Clancy, "A Realistic Channel Model for Radar/Cellular Coexistence in the 3.5 GHz Band," Virginia Tech Hume Center Technical Report HC-R140007, July 2014
7. J. Mahal, A. Abdelhadi, T. Clancy, "Impact of Location and Mobility on Radar/Cellular Coexistence in 3.5 GHz Band," Virginia Tech Hume Center Technical Report HC-R140006, July 2014
8. T. Clancy, W. Clark, "Fundamental Bounds on Learning in Cognitive Electronic Warfare Systems," Virginia Tech Hume Center Technical Report HC-R140005, March 2014
9. A. Khawar, A. Abdelhadi, T. Clancy, "Spectral Coexistence using MIMO Radar Platforms," Virginia Tech Hume Center Technical Report HC-R140002, March 2014

10. T. Clancy, "Security in Long Term Evolution and the Evolved Packet Core," Technical Report SR-2013-02, CTIA, October 2013
11. J. White, T. Clancy, "Security of BYOD Mobility Models," Technical Report SR-2013-01, CTIA, September 2013
12. N. Krishnan, S. Hitefield, T. Clancy, R. McGwier, J. Tront, "Multipersona Hypovisors: Securing Mobile Devices through High-Performance Light-Weight Subsystem Isolation," Virginia Tech CS Tech Report, TR-13-02, June 2013
13. T. Clancy, J. Mitola, A. Amanna, R. McGwier, J. Reed, "Comments on Amendment of the Commissions Rules with Regard to Commercial Operations in the 3550-3650 MHz Band," Federal Communications Commission, GN Docket No. 12-354, February 2013
14. T. Clancy, "Security Recommendations for Military Use of Dynamic Spectrum Access Technology," Hume Center Tech Report VT-HCNST-10-002, Virginia Tech, July 2011
15. T. Clancy, T. OShea, "Recommendations for Military Use of Wireless MAN Technology," Technical Report, Department of Defense, August 2009
16. T. Clancy, "Dynamic Spectrum Access in Cognitive Radio Networks," Ph.D. Dissertation, University of Maryland, April 2006
17. R. Blahut, T. Clancy, X. Hua, J. Kim, N. Kiyavash, M. Ma, K. Markandan, S. Mathur, M. Nigam, D. Pozdol, S. Song, S. Sriram, A. Suk, B. Wang, T. Wong, A. Vovchak, "Secure Middleware for Infrastructure Systems," Technical Report, Coordinated Science Laboratory, University of Illinois, January 2004
18. T. Clancy, "Analysis of FPGA-based Hyperelliptic Curve Cryptosystems," Masters Thesis, University of Illinois, December 2002

## Standards

### Published RFCs

1. S. Hartman (Ed), T. Clancy, K. Hoepfer, "Channel Binding Support for EAP Methods," RFC 6677, Proposed Standard, July 2012
2. T. Clancy, H. Tschofenig, "EAP Generalized PSK (GPSK)," RFC 5433, Proposed Standard, February 2009
3. S. Kelly, T. Clancy, "CAPWAP Threat Analysis for 802.11 Deployments," RFC 5418, Informational, December 2008
4. P. Calhoun, M. Montemurro, D. Stanley, B. O'Hara, R. Suri, N. Winget, S. Kelly, M. Williams, S. Hares, E. Rescola, P. Narasimhen, D. Harkins, S. Ponnuswamy, T. Clancy, "CAPWAP Protocol Specification," RFC 5415, Proposed Standard, December 2008
5. T. Clancy, M. Nakhjiri, V. Narayanan, L. Dondeti, "Handover Key Management and Re-Authentication Problem Statement," RFC 5169, Informational, March 2008
6. T. Clancy, W. Arbaugh, "EAP Password Authenticated Exchange," RFC 4746, Informational, November 2006

### Internet Drafts

1. T. Clancy, A. Lior (Ed), G. Zorn, K. Hoepfer, "EAP Method Support for Transporting AAA Payloads," draft-clancy-emu-aaapay, Standards Track, November 2010
2. T. Clancy, "HOKEY Re-authentication Protocol Plan," draft-clancy-hokey-plan, April 2007

## Intellectual Property

3. T. Clancy, N. Petroni, W. Arbaugh, "Technique for Method-Specific Fast EAP Rekeying," draft-clancy-eap-rekeying, February 2004

### Awarded Patents

1. J. White, T. Clancy, "Systems and Methods to Enforce Security Policies on the Loading, Linking, and Execution of Native Code by Mobile Applications Running inside of Virtual Machines," (US 9,609,020 awarded March 2017), filed April 2013
2. J. White, B. Dougherty, T. Clancy, D. Hamrick, G. Sharpe, R. Hanlin, K. Zienkiewicz, C. Thompson, "Systems and Methods to Synchronize Data to a Mobile Device Based on a Device Usage Context," (US 9,578,445 awarded February 2017), filed March 2014
3. A. Amanna, T. Clancy, "Method of Network Sharing between Public Safety and Commercial Users," (US 9,544,778 awarded January 2017), filed March 2014
4. A. Amanna, J. Mitola, R. Tandon, T. Clancy, J. Reed, R. McGwier, A. Sengupta, A. Kumar, "System and Method for Heterogeneous Spectrum Sharing Between Commercial Cellular Operators and Legacy Incumbent Users in Wireless Networks," (US 9,516,508 awarded December 2016), filed March 2013
5. A. Amanna, J. Mitola, T. Clancy, J. Reed, R. McGwier, S. Hitefield, A. Pham, S. Bernales, M. Fowler, "System and Method of Distributed Data Management in Wireless Networks," US 9,391,749 awarded July 2016, filed March 2013
6. B. Dougherty, T. Clancy, J. White, D. Hamrick, G. Sharpe, R. Hanlin, K. Zienkiewicz, C. Thompson, "Systems and Methods for Restricting Access to Network Resources via In-Location Access Point Protocol," US 9,363,670 awarded June 2016, filed August 2012
7. I. Lee, S. Yun, W. Arbaugh, T. Clancy, M. Shin, "Authentication Method for Wireless Distributed System," (US 7,756,510 awarded July 2010; EP 1,722,589 awarded November 2006; CN 101,189,826 awarded November 2011), filed May 2006

### Filed Patents

1. C. White, B. Dougherty, D. Hamrick, G. Sharpe, R. Hanlin, K. Zienkiewicz, C. Thompson, T. Clancy, "Systems and Methods for Enforcing Security in Mobile Computing," (US utility filing 14/210,382), filed January 2013
2. B. Dougherty, C. White, T. Clancy, D. Hamrick, G. Sharpe, R. Hanlin, K. Zienkiewicz, C. Thompson, "Systems and Methods for Enforcing Security in Mobile Computing," (International PCT/US13/20575), filed January 2013
3. T. Clancy, J. White, "Systems and Methods for Enforcing Access Control Policies on Privileged Accesses for Mobile Devices," (US utility filing 13/909,366), filed June 2012
4. T. Clancy, J. White, "Systems and Methods for Enhancing Mobile Device Security with a Processor Trusted Zone," (US utility filing 13/922,673), filed June 2012
5. B. Dougherty, C. White, T. Clancy, D. Hamrick, G. Sharpe, R. Hanlin, K. Zienkiewicz, C. Thompson, "Systems and Methods to Secure Short-Range Proximity Signals," (US utility filing 14/210,240), filed March 2014

### Filed Provisional Patents



1. A. Abdelhadi, T. Clancy, R. McGwier, J. Mitola, "System and Method for Optimal Resource Allocation Using Joint Carrier Aggregation," (US provisional filing 61/859,536), filed July 2013
2. H. Shajaiah, A. Abdelhadi, T. Clancy, "Utility Proportional Fairness Resource Allocation with Carrier Aggregation in 4G-LTE," (US provisional filing 61/828,624), filed May 2013
3. B. Dougherty, C. White, T. Clancy, D. Hamrick, G. Sharpe, R. Hanlin, K. Zienkiewicz, C. Thompson, "System and Method for Securing the Boot Process of a Device using Credentials Stored on an Authentication Token," (US provisional filing 61/779,931), filed March 2013
4. T. Clancy, R. Kurrle, A. Abdelhadi, "Method for Distributed Resource Allocation in LTE Networks Based on User Demand," (US provisional filing 61/787,317), filed March 2013
5. T. Clancy, J. Mitola, R. McGwier, A. Abdelhadi, "Method for Radio Resource Shadow Pricing," (US provisional filing 61/787,367), filed March 2013
6. J. Reed, H. Volos, R. Buehrer, K. Rele, M. Sohul, T. Clancy, R. McGwier, "Cognitive Radio Implementations for LTE," (US provisional filing 61/683,491), filed August 2012
7. S. Sodagari, A. Khawar, T. Clancy, R. McGwier, "A Projection Based Methodology for Radar and Telecommunication Systems Coexistence," (US provisional filing 61/646,453), filed May 2012
8. T. Clancy, N. Krishnan, S. Hitefield, "High Assurance Light-Weight Virtualization for Mobile Devices," (US provisional filing 61/614,005), filed March 2012
9. T. Clancy, J. White, B. Dougherty, "Method to Enforce Data Provenance in Mobile Computing," (US provisional filing 61/583,605), filed January 2012
10. J. White, T. Clancy, B. Dougherty, "Method to Enforce Security Policies using a Distributed Object-Oriented IPC Firewall," (US provisional filing 61/584,284), filed January 2012
11. T. Clancy, J. White, B. Dougherty, "Method to Protect against Malware Threats in Mobile Computing," (US provisional filing 61/583,610), filed January 2012

#### **Invention Disclosures**

1. H. Shajaiah, A. Abdelhadi, T. Clancy, "Spectrum Sharing Between Public Safety and Commercial Groups of Users In 4G-LTE," Virginia Tech Intellectual Properties Disclosure 14-007, 2014
2. H. Shajaiah, A. Abdelhadi, T. Clancy, J. Mitola, "Multiple Stage Resource Allocation from Multiple Network Operators with Carrier Aggregation in 4G-LTE," Virginia Tech Intellectual Properties Disclosure 14-006, 2014
3. J. White, T. Clancy, "Method to Use a Mobile Device Management System to Prevent Information Exfiltration by Messaging Services," Virginia Tech Intellectual Properties Disclosure 12-007, 2012
4. T. Clancy, J. Reed, R. McGwier, "Method for the Use of Georeference Databases and Spectrum Sensing for Heterogeneous Spectrum Sharing in Mobile Broadband Networks," Virginia Tech Intellectual Properties Disclosure 12-125, 2012
5. T. Clancy, J. Reed, R. McGwier, "Method for Operating a Market for Sublicensed Access to Electromagnetic Spectrum," Virginia Tech Intellectual Properties Disclosure 12-124, 2012

## Media and Talks

6. A. Abdelhadi, T. Clancy, R. McGwier, J. Mitola, "Method for Optimal Resource Allocation with Carrier Aggregation for Cellular Networks," Virginia Tech Intellectual Properties Disclosure 12-163, 2012

### News Coverage and Commentary

1. "National Security Commentator: UK Terrorism Attack, Cybersecurity, Presidential Wiretapping Stories," Fox 5 News at 6:30pm (WTTG), March 22, 2017

### Radio and Podcasts

1. "NSA Makes Virginia Tech Center of Excellence in Cyber Operations," NPR Radio IQ (WVTF), May 26, 2017
2. "5G Mobile Technologies," The CyberWire, April 28, 2017
3. "Vault-7 vs. Shadowbrokers Impact," The CyberWire, April 18, 2017
4. "Telephony Control-Plane Security," The CyberWire, April 4, 2017
5. "End to End Encryption," The CyberWire, March 13, 2017
6. "Election Infrastructure as Critical Infrastructure," The CyberWire, February 24, 2017
7. "Security for the Internet of Things," NPR Radio IQ (WVTF), February 10, 2016
8. "Mobile Device Encryption Standards," The CyberWire, December 22, 2016
9. "Cybersecurity: 5G Cellular," Pulse of the Planet (NPR Syndicated), December 19, 2016
10. "Cybersecurity: Cloud to the Rescue," Pulse of the Planet (NPR Syndicated), December 16, 2016
11. "Cybersecurity: Cyber Warfare," Pulse of the Planet (NPR Syndicated), December 15, 2016
12. "Cybersecurity: IDing the Fridge," Pulse of the Planet (NPR Syndicated), December 14, 2016
13. "Cybersecurity: Cybercrime, hacktivism, espionage, and warfare," Pulse of the Planet (NPR Syndicated), December 9, 2016
14. "Cybersecurity: Hacking the Grid," Pulse of the Planet (NPR Syndicated), December 8, 2016
15. "Cybersecurity: Hacker to Defender," Pulse of the Planet (NPR Syndicated), December 7, 2016
16. "Dual Use Cybersecurity Solutions," The CyberWire, December 7, 2016
17. "Virginia Cyber Range," The CyberWire, November 18, 2016
18. "Quantum Information Processing and Encryption," The CyberWire, October 24, 2016
19. "Cybersecurity and Presidential Politics," The CyberWire, October 7, 2016
20. "Software Defined Networking," The CyberWire, September 29, 2016
21. "MedSec/Muddy Waters," The CyberWire, September 20, 2016
22. "5G Wireless," The CyberWire, August 9, 2016

23. "Smart Cities," The CyberWire, July 25, 2016
24. "Data Privacy," The CyberWire, July 11, 2016
25. "Transportation Cybersecurity," The CyberWire, June 22, 2016
26. "Cyber Threat Information Sharing," The CyberWire, June 15, 2016

### **Print Media**

1. "Workforce development, partnerships cited as key to securing wireless cybersecurity," Cabling Installation and Maintenance, July 16, 2017
2. "Workforce development and partnerships key to securing wireless technology," Augusta Free press, July 15, 2017
3. "Security Alert: Hill Digs Into Innovating with IoT while Protecting Consumers," Cablefax, July 15, 2017
4. "Lawmakers Voice Fears over Security of Internet Devices," The Hill, June 14, 2017
5. "Rep. Pallone: GOP Playing Politics With National Security," Multichannel, June 13, 2017
6. "Higher Ed Stepping in to Fill Cybersecurity Gaps," Education Drive, May 31, 2017
7. "Policy implications of WikiLeaks dump differ from Snowden leaks," Washington Examiner, March 13, 2017
8. "Herndon start-up HawkEye360 wants to send fleets of tiny satellites into orbit," Washington Post, November 23, 2016
9. "Local inventors win cybersecurity patent," Fauquier Now, September 29, 2016
10. "Inside the New Arms Race to Control Bandwidth on the Battlefield," Wired, March 2014

### **Press Coverage**

1. "HawkEye 360 Selects Deep Space Industries to Manufacture Pathfinder Small Satellites," Business Wire, May 2016
2. "HawkEye 360 Expands Management Team to Accelerate Commercial Development of Space-Based Radio Frequency Mapping and Analytics Technology," Business Wire, April 2016
3. "CACI Becomes Anchor Partner in Cyber-Physical System Security Program With Virginia Tech Hume Center," Business Wire, February 2016
4. "Allied Minds Announces the Formation of HawkEye 360," Business Wire, September 2015
5. "Optio Labs Names Mobile Industry Veteran Gregg Smith as Chief Executive Officer," Business Wire, December 2014
6. "Federated Wireless Applauds FCC for Adopting Three-Tier Spectrum Sharing Network and Recommends That the Exclusion Zones Be Eliminated to Broaden Access Further," Business Wire, July 2014
7. "Mobile Security Software Developer Optio Labs Raises \$10 Million in Series A Round," Business Wire, March 2014

8. "Optio Labs Appoints Mobile and Cyber Security Industry Veteran Matt Hartley as General Manager to Drive Commercial Expansion," Business Wire, August 2013

### Invited Talks

1. "Sherpa, Artificial Intelligence and Machine Learning Panel," AFCEA/INSA Intelligence and National Security Summit, Washington, DC, September 2017
2. "Moderator, Leveraging Broader Federal Funding for I/UCRCs," NSF Industry/University Cooperative Research Center Conference, Arlington, VA, July 2017
3. "Panelist, Partnering with Academia: Growing Relationships between the IC and Academia," IC STEM Recruitment Summit, Bethesda, MD, June 2017
4. "Witness, Promoting Security in Wireless Technology," US House of Representatives, Energy and Commerce Committee, Communications and Technology Subcommittee, Washington, DC, June 2017
5. "Moderator, Cyber Threat Sharing," Commonwealth Conference on National Defense and Intelligence, Charlottesville, VA, June 2017
6. "Panelist, Emerging Technology: Internet of Things," LMI Research Institute Government-University Forum, Vienna, VA, May 2017
7. "Panelist, Cybersecurity Challenges and What Congress Can Do About It," Virginia Tech Roundtable on Capitol Hill, Washington, DC, March 2017
8. "Speaker/Panelist, Cybersecurity for Commercial Aviation," United Technologies Research Center, East Hartford, CT, March 2017
9. "5G, IoT, and Edge Computing," Brourd Bag Seminar, G2 Inc, Annapolis Junction, MD, February 2017
10. "Panelist, Machine Learning: Research and Applications," IEEE Global Signal and Information Processing (GlobalSIP), Washington, DC, December 2016
11. "Moderator, Force Multipliers to Future Cybersecurity," NVTC Capital Cybersecurity Conference, Vienna, VA, November 2016
12. "Moderator, Commercialization of State of the Art Cyber Research Panel," Virginia Tech Enterprise Forum: The Evolution and Expansion of Cybersecurity, Arlington VA, October 2016
13. "Moderator, IoT as a Game Changer Panel," Virginia Governor's Cyber-Physical Systems Summit, Newport News, VA, September 2016
14. "Keynote: Deep Neural Signal Processing," GNU Radio Annual Conference (GRcon), Boulder, CO, September 2016
15. "Challenges and Opportunities with Power Infrastructure Cybersecurity," IEEE Power and Energy Society MD Section, Baltimore, MD, September 2016
16. "Challenges and Opportunities with Power Infrastructure Cybersecurity," IEEE Power and Energy Society VA/DC Section, Arlington, VA, June 2016
17. "Cyber Careers Panel Moderator," Business Higher Education Forum CyberLeaders Kickoff, Arlington, VA, June 2016
18. "Keynote Speaker," ForeScout Best Practice Seminar, Washington, DC, May 2016
19. "Moderator, Harnessing the Next Technological Revolution Panel," AFCEA Intelligence Symposium, Springfield, VA, April 2016
20. "Academic Panel," Northrop Grumman Executive Symposium, Falls Church, VA, March 2016

21. "Electronic Warfare in Modern Military Operations," Information Warfare Guest Lecture, Georgetown University, Washington, DC, February 2016
22. "Assured Communications Panel," IEEE Military Communications Conference, Tampa, FL, October 2015
23. "Cybersecurity Risks to Connected Vehicles and Smart Infrastructure," ITS America Webinar, October 2015
24. "Cognition and Autonomy in Electronic Warfare Platforms," Electromagnetic Spectrum Operations Summit, Alexandria, VA, May 2015
25. "Cognitive Electronic Warfare: An Information Theory and Machine Learning Perspective," Association of Old Crows Luncheon, Arlington, VA, March 2015
26. "Information Security and Privacy in the Mobile World," Virginia Tech Presidential Installation Academic Showcase, Blacksburg, VA, October 2014
27. "Applications of Cognition to MIMO Radar for Spectrum Sharing," Cognitive RF Workshop, Army Research Labs, Adelphi, MD, June 2014
28. "Risk-Based Cybersecurity Regulation and the NIST Framework," CIO Summit, Richmond, VA, June 2014
29. "Broadband Access and the Digital Divide," Virginia Wireless Association Seminar, Alexandria, VA, May 2014
30. "Future Directions in Cyber Warfare and Electronic Warfare," Naval Postgraduate School Foundation Roundtable, Washington, DC, April 2014
31. "Future Directions in Cyber Warfare and Electronic Warfare," Virginia Military Institute Seminar, Lexington, VA, April 2014
32. "Convergence of Electronic Warfare and Cyber Warfare: First Principals," Cyber/EW CAG, L-3 Communications, Arlington, VA, March 2014
33. "The Science of Electronic Warfare: Bounds on Target Knowledge," Sensors Directorate Seminar, Air Force Research Labs, Dayton, OH, February 2014
34. "Control Theory and the Dynamics of Cybersecurity," EECS With-It Seminar, Vanderbilt University, Nashville, TN, January 2014
35. "Senior Leaders Panel," US Army Future Warfare Division, Army Capabilities Integration Center, Williamsburg, VA, January 2014
36. "Spectrum Sharing to Support Commercial use of Military Spectrum," Classified US Military Communications Conference, McLean, VA, November 2013
37. "Keynote: Broadband Access and the Digital Divide," Exploring Loudoun Countys Digital Divide, Ashburn, VA, November 2013
38. "Cybersecurity Research, Education, and Outreach at Virginia Tech," Dulles Chamber Innovate Conference, Dulles, VA, October 2013
39. "Security Challenges with LTE-Advanced Systems and Military Spectrum," IEEE Communications Society (COMSOC) Baltimore Section, Linthicum, MD, October 2013
40. "Vulnerability Assessment of Emerging Mobile Core Networks," Cellular Telephone Industry Association (CTIA), Cybersecurity Working Group Meeting, Washington, DC, October 2013
41. "Security and Management of Android Devices," Google Federal Technology Workshop, Washington, DC, June 2013
42. "How Secure is Your Smartphone," Wireless @ Virginia Tech Advisory Board Meeting, Blacksburg, VA, May 2013

43. "Cyber-Physical Security: Hacking the Internet of Things," Virginia Tech Black Swan Seminar, Blacksburg, VA, April 2013
44. "Secure Mobility: From RF to Apps," Electrical and Computer Engineering Seminar, Virginia Tech, Blacksburg, VA, April 2013
45. "Research Directions in Security," Research Day, Virginia Tech Center for Embedded Systems and Critical Applications, Arlington, VA, March 2013
46. "Cyber Warfare: Intersection of Technology and Analytics," DIA Five Eyes Analytic Training Workshop, Harrisonburg, VA, February 2013
47. "Jamming and Next-Generation Commercial Waveforms," DOD CIO LTE Jamming Technical Exchange Meeting, McLean, VA, February 2013
48. "Security and Management of Android Devices," Google Mobile Security Forum, Washington, DC, November 2012
49. "Cybersecurity Education," Cyber Innovation Symposium, Intelligence and National Security Alliance (INSA), Washington, DC, September 2012
50. "Cyber Education and Research at Virginia Tech," NSA Information Assurance Symposium, Nashville, TN, August 2012
51. "Cybersecurity for Mobile Broadband Networks," Cellular Telephone Industry Association (CTIA), Cybersecurity Working Group, Arlington, VA, July 2012
52. "Cybersecurity Innovation and Research," Virginia Tech Intelligence and Defense Executive Alumni Event, Arlington, VA, June 2012
53. "Wireless and Mobile Security Trends," Center for High Assurance Computer Systems Seminar, Naval Research Laboratory, Washington, DC, June 2012
54. "Security and Robustness of TD-LTE for Public Safety Applications," Security and Software Engineering Research Center (S2ERC) Showcase, Arlington, VA, May 2012
55. "Cognitive Radar for Spectrum Coexistence," Communications Research Gathering, Office of Naval Research, Washington, DC, May 2012
56. "Mobile Security Research and Trends," Northrop Grumman Mobile Community of Interest, McLean, VA, May 2012
57. "Cybersecurity Research and Education at Virginia Tech," Cybersecurity Workshop and Panel, Office of Congressman Jim Moran, Arlington, VA, April 2012
58. "Electronic Warfare and Cyber Warfare," Association of Old Crows, Naval Research Labs, Washington, DC, April 2012
59. "Tactical ISR Challenges with 5G Cellular Communications," US Marine Radio Battalion Users Conference, Monterey, CA, April 2012
60. "Cybersecurity Research and Development at Virginia Tech," Panelist, Northern Virginia Technology Council, Vienna, VA, March 2012
61. "Securing the Mobile Frontier," Panel Moderator, Executive Discussion on Cybersecurity and Mobility, Washington, DC, February 2012
62. "Electronic Warfare in a Cyber Battlefield," IDGA Network Enabled Operations Summit, Alexandria, VA, January 2012
63. "Making Sense of Intelligence through Visualization," ManTech WoW Technical Conference, Stafford, VA, September 2011
64. "Security's Promising Directions and Biggest Challenges," Security and Software Engineering Research Center Workshop, Ball State University, Muncie, IN, May 2011

65. "International Technology and Policy Impact of Cyber Warfare," Virginia Tech Cybersecurity Summit and Competition, Blacksburg, VA, April 2011
66. "Cybersecurity Panel," Panelist, Special Session on National Security: Cybersecurity & Wireless Communications, Howard University, Washington, DC, September 2010
67. "An Insider's View of Working for the US Federal Government," Intelligence Community Center of Academic Excellence Seminar, Virginia Tech, Blacksburg, VA, September 2010
68. "TRANSEC and COMSEC Recommendations for a Military WiMAX Profile," DoD 802.16 Secure Profile Industry Day, McLean, VA, July 2009
69. "Using Game Theory to Analyze Spectral Fairness and Robustness to Adversarial Agents in DSA Networks," DSO Workshop on Dynamic Spectrum Access, Arlington, VA, June 2009
70. "Security Threats to Intelligent Networks," Department Seminar, Universidad de Murcia, Spain, May 2009
71. "New protocol standards for wireless mobility: CAPWAP and HOKEY," Security for Seamless Mobility Forum, IEEE Globecom 2008, New Orleans, December 2008
72. "Game Theory and Dynamic Spectrum Access," Emerging Spectrum Technology Workshop, Defense Spectrum Organization, March 2008
73. "Security Threats to Intelligent Wireless Networks," Security and Privacy for 4G Workshop, IEEE Globecom 2007, Washington, DC, November 2007
74. "Securing Next-Generation Mobile Networks: How Far Are We?," Panelist, Security and Privacy for 4G Workshop, IEEE Globecom 2007, Washington, DC, November 2007
75. "Challenges in Signal Detection and Identification," SASDCRT Symposium, Naval Postgraduate School, Monterey, CA, September 2007
76. "Software-Defined and Cognitive Radio," University of Maryland Telecommunications Seminar, College Park, MD, February 2007
77. "Whither WiMAX," Red Blue (ReBl) Symposium, Johns Hopkins Applied Physics Lab, Laurel, MD, October 2006
78. "Open-Source Cognitive Radio," SASDCRT Symposium, Naval Postgraduate School, Monterey, CA, September 2006
79. "Unlicensed Devices in Licensed Bands," Communications Seminar, University of Illinois Urbana-Champaign, Urbana, IL, May 2006
80. "CAPWAP System Security," CAPWAP Working Group, Internet Engineering Task Force, Vancouver, BC, November 2005
81. "Interference Temperature Multiple Access," Virginia Tech Wireless Seminar, Blacksburg, VA, November 2005
82. "EAP Password Authenticated Exchange," EAP Working Group, Internet Engineering Task Force, San Diego, CA, August 2004
83. "Password Authentication in the Wireless World," Rose-Hulman Institute of Technology, Terre Haute, IN, March 2004
84. "Provably Secure Middleware for Distributed Application Development," Boeing Phantomworks, Seattle, WA, November 2003
85. "FPGA-Based Hyperelliptic Curve Cryptosystems," AMS Central Section Meeting, Indiana University, Bloomington, April 2003
86. "On the Feasibility and Security of Biometric Cryptosystems," Rose-Hulman Institute of Technology, Terre Haute, IN, March 2003