Cliff C. Zou
Curriculum Vitae

RESUME

Name   Cliff C. Zou
          (Legal name: Changchun Zou)

Education

Ph.D. in Electrical and Computer Engineering   September 2005
University of Massachusetts at Amherst   Amherst, MA
Advisors: Weibo Gong and Don Towsley

M.S., and **B.S.** in Electrical Engineering   July 1999, & July 1996
University of Science & Technology of China (USTC)   Hefei, China

Professional Positions

Associate Professor   August 2011 - Present
          Department of Electrical Engineering and Computer Science
          Computer Science Division
          University of Central Florida
          Orlando, FL

Assistant Professor in University of Central Florida   August 2005 – July 2011
          School of Electrical Engineering and Computer Science
          University of Central Florida
          Orlando, FL

Publications

Total Google Scholar Citations of all of my publications (2002 ~ Dec. 2013):   3550

Referreed Chapters in Edited Book

Sherri Sparks, Shawn Embleton, Cliff C. Zou. "Windows Rootkits - a Game of "Hide and Seek"," in *Y. Xiao, F.H. Li, and H. Chen (Eds): Handbook of Security and Networks*, Chapter 14, pp.345-369, World Scientific Publishing Co., ISBN-10: 9814273031, ISBN-13: 978-9814273039, 2011. pp. 345-368.

Ping Wang, Baber Aslam*, Cliff C. Zou, "Peer-to-Peer Botnets: The Next Generation of Botnet Attacks", in *Stavroulakis, Peter; Stamp, Mark (Eds): Handbook of Information and Communication Security*, Chapter 18, Springer Press, 2010, pp. 335-350

Soyoung Park, Cliff C. Zou, Damla Turgut. "Reliable Traffic Information Propagation in Vehicular Ad hoc Networks," in *R. Beyah, J. McNair, and C. Corbett (Eds): Security in Ad-hoc and Sensor Networks*, Chapter 9, World Scientific Press, 2009, pp. 261-291.

Steven Zittrower and Cliff C. Zou, "Encrypted Ranked Proximity and Phrase Searching in the Cloud", to appear in Al-Sakib Khan Pathan (Ed): *The State of the Art in Intrusion Prevention and Detection*, CRC Press, Taylor & Francis Group, USA, 2014.

Referreed Journal Papers

Baber Aslam, Ping Wang, Cliff Zou, "Extension of Internet Access to VANET via Satellite Receive-only Terminals", to appear in *International Journal of Ad Hoc and Ubiquitous Computing* (IJAHUC), 2013.

Sheng Wen, Wei Zhou, Jun Zhang, Yang Xiang,Wanlei Zhou, Weijia Jia,Cliff C. Zou, "Modeling and Analysis on the Propagation Dynamics of Modern Email Malware", to appear in *IEEE Transactions on Dependable and Secure Computing*.

Dondyk, E., Rivera, L. and Zou, C.C. "Wi-Fi Access Denial of Service Attack to Smartphones", *Int. J. Security and Networks*, Vol. 8, No. 3, pp.117–129, 2013.

Shawn Embleton, Sherri Sparks, Cliff C. Zou, "SMM Rootkit: A New Breed of OS Independent Malware", to appear in *Wiley Journal of Security and Communication Networks*.

Soyoung Park, Baber Aslam, Damla Turgut, Cliff C. Zou, "Defense against Sybil Attack in the Initial Deployment Stage of Vehicular Ad hoc Network based on Roadside Unit Support", *Wiley Journal of Security and Communication Networks*, Vol. 6, No. 4, 2013, pp. 523-538.

Corey McCall, Branden Maynes, Cliff C. Zou, Ning J. Zhang, "An automatic medication self-management and monitoring system for independently living patients", *Elsevier Journal of Medical Engineering & Physics*, Vol. 35, No. 4, 2013, pp. 505-514.

Lei Wu, Jerome Harrington, Corey Kuwanoe, Cliff C. Zou, "Harnessing the Power of BitTorrent for Distributed Denial-of-Service Attacks", *Wiley Journal of Security and Communication Networks,* 4(8), p.860-870, 2011.

Ping Wang, Sherri Sparks, Cliff C. Zou. "An Advanced Hybrid Peer-to-Peer Botnet", in *IEEE Transactions on Dependable and Secure Computing,* 7(2), 113-127, April-June, 2010.

Baber Aslam, Soyoung Park, Cliff Zou, and Damla Turgut. "Secure Traffic Data Propagation in Vehicular Ad hoc Networks", in *International Journal of Ad Hoc and Ubiquitous Computing* (IJAHUC), 6(1), 24-39, 2010.

Ping Wang, Lei Wu, Ryan Cunningham, Cliff C. Zou. "Honeypot Detection in Advanced Botnet Attacks", *International Journal of Information and Computer Security* (IJICS), 4(1), 30–51, 2010.

Cliff C. Zou, Don Towsley, Weibo Gong. "Modeling and Simulation Study of the Propagation and Defense of Internet Email Worm," *IEEE Transactions on Dependable and Secure Computing,* 4(2), 105-118, April-June 2007.

Cliff C. Zou, Nick Duffield, Don Towsley, Weibo Gong. "Adaptive Defense Against Various Network Attacks," *IEEE Journal on Selected Areas in Communications: High-Speed Network Security* (J-SAC), 24(10), 1877-1888, October 2006.

Cliff C. Zou, Don Towsley, and Weibo Gong. "On the Performance of Internet Worm Scanning Strategies," *Elsevier Journal of Performance Evaluation*, 63(7), 700-723, July 2006.

Cliff C. Zou, Don Towsley, Weibo Gong, Songlin Cai. "Advanced Routing Worm and Its Security Challenges," *Simulation: Transactions of the Society for Modeling and Simulation International*,

82(1), 75-85, 2006.

Cliff C. Zou, Weibo Gong, Don Towsley, and Lixin Gao. "The Monitoring and Early Detection of Internet Worms," *IEEE/ACM Transactions on Networking*, 13(5), 961-974, October 2005.

Referreed Conference and Workshop Papers

Baber Aslam, Faisal Amjad, Cliff C. Zou, "PMTR: Privacy-enhancing Multilayer Trajectory-based Routing Protocol for Vehicular ad hoc Networks", to appear in *IEEE Military Communications Conference* (MILCOM), San Diego, Nov. 18-20, 2013.

Faisal Amjad, Baber Aslam, Cliff C. Zou, "Reputation Aware Collaborative Spectrum Sensing for Mobile Cognitive Radio Networks", to appear in *IEEE Military Communications Conference* (MILCOM), San Diego, Nov. 18-20, 2013.

Faisal Amjad, Baber Aslam, Cliff C. Zou, "DS3: A Dynamic and Smart Spectrum Sensing Technique for Cognitive Radio Networks Under Denial of Service Attack", to appear in *IEEE Globecom*, Atlanta, Dec. 9-13, 2013.

Erich Dondyk, Cliff C. Zou, "Denial of Convenience Attack to Smartphones Using a Fake Wi-Fi Access Point," in *10th Annual IEEE Consumer Communications and Networking Conference* (CCNC), Las Vegas, Jan. 11-14, 2013, pp. 164-170.

Faisal Amjad, Baber Aslam, Cliff C. Zou, "Transparent Cross-Layer Solutions for Throughput Boost in Cognitive Radio Networks," in *10th Annual IEEE Consumer Communications and Networking Conference* (CCNC), Las Vegas, Jan. 11-14, 2013, pp. 580-586.

Rung-Ching Chen, Wei-Lung Chang, Chia-Fen Shieh, Cliff C. Zou, "Using Hybrid Artificial Bee Colony Algorithm to Extend Wireless Sensor Network Lifetime," *Third International Conference on Innovations in Bio-Inspired Computing and Applications* (IBICA), Sept. 26-28, 2012. pp. 156-161.

Steven Zittrower, Cliff C. Zou, "Encrypted Phrase Searching in the Cloud," *IEEE Global Communications Conference* (GLOBECOM), Dec. 3-7, 2012. pp. 764-770.

Baber Aslam, Faisal M. Amjad, Cliff C. Zou, "Optimal Roadside Units Placement in Urban Areas for Vehicular Networks," in *17th IEEE Symposium on Computers and Communications* (ISCC), Turkey, Jul. 1-4, 2012. pp. 423-429.

Jim Bardgett, Cliff C. Zou, "nSwitching: Virtual Machine Aware Relay Hardware Switching to improve intra-NIC Virtual Machine Traffic", in *IEEE International Conference on Communications* (ICC), Ottawa, Canada, Jun. 10-15, 2012. pp. 2700-2705.

Huy D. Truong, Christopher F. Turner, Cliff C. Zou, "iCAPTCHA: The Next Generation of CAPTCHA Designed to Defend Against 3rd Party Human Attacks", to appear in *IEEE International Conference on Communications*, (ICC), Kyoto, Japan, Jun. 5-9, 2011.

Soyoung Park, Baber Aslam, Cliff C. Zou, "Long-term Reputation System for Vehicular Networking based on Vehicle's Daily Commute Routine", in *8th Annual IEEE Consumer Communications and Networking Conference* (CCNC), Las Vegas, Jan. 9-12, 2011. (Acceptance ratio: 95/305 = **31.1%**)

Baber Aslam, Cliff C. Zou, "One-way-linkable Blind Signature Security Architecture for VANET", in *8th*

Annual IEEE Consumer Communications and Networking Conference (CCNC), Las Vegas, Jan. 9-12, 2011. (Acceptance ratio: 95/305 = **31.1%**)

Corey McCall, Branden Maynes, Cliff C. Zou, Ning Zhang. "RMAIS: RFID-based Medication Adherence Intelligence System", in *32nd Annual International Conference of the IEEE Engineering in Medicine and Biology Society* (EMBC), Buenos Aires, Argentina, Aug.31-Sept. 4, 2010, pp. 3768–3771.

Baber Aslam, Lei Wu, Cliff C. Zou. "PwdIP-Hash: A Lightweight Solution to Phishing and Pharming Attacks", in *IEEE International Symposium on Network Computing and Applications* (NCA), 15-17 July, 2010, pp. 198-203.

Peter Matthews, Cliff C. Zou. "Scene Tagging: Image-Based CAPTCHA Using Image Composition and Object Relationships", in *ACM Symposium on Information, Computer and Communications Security* (ASIACCS), Beijing, China, 13-16 Apr. 2010, pp. 345-350. (6-page short paper, Acceptance ratio: 38/166=**23%**)

Baber Aslam, Cliff C. Zou. "Distributed Certificate and Application Architecture for VANETs", *IEEE Military Communications Conference* (MILCOM), pp. 1-7, Boston, Oct. 18-21, 2009.

Soyoung Park, Baber Aslam, Damla Turgut, Cliff C. Zou. "Defense against Sybil Attack in Vehicular Ad-Hoc Network based On Roadside Units Support", *IEEE Military Communications Conference* (MILCOM), pp. 1-7, Boston, Oct. 18-21, 2009.

Baber Aslam, Ping Wang, Cliff C. Zou. "Pervasive Internet Access by Vehicles through Satellite Receive-only Terminals", *International Conference on Computer Communications and Networks* (ICCCN), pp. 1-6, San Francisco,Aug. 2-6, 2009.(Acceptance ratio: 114/387 = **29.5%)**

Ping Wang, Lei Wu, Baber Aslam, Cliff C. Zou. "A Systematic Study on Peer-to-Peer Botnets", *International Conference on Computer Communications and Networks* (ICCCN), pp. 1-8, San Francisco, Aug. 2-6, 2009.(Acceptance ratio: 114/387 = **29.5%)**

Sherri Sparks, Shawn Ambleton, Cliff C. Zou. "A Chipset Level Network Backdoor: Bypassing Host-Based Firewall & IDS", to appear in Proceedings of ACM Symposium on Information, Computer and Communications Security (ASIACCS), pp. 125-134, Sydney, Australia, 10-12 Mar 2009. (Acceptance ratio: 33/147 = **22.5%)**

Baber Aslam, Ping Wang, Cliff C. Zou. "An Economical, Deployable and Secure Vehicular Ad hoc Network", in *Proceedings of IEEE Military Communications Conference* (MILCOM'08), pp. 1-7, San Diego, November 17-19, 2008.

Shawn Embleton, Sherri Sparks, Cliff C. Zou. "SMM Rootkits: A New Breed of OS Independent Malware", in *Proceedings of 4th International Conference on Security and Privacy in Communication Networks* (SecureComm), Istanbul, Turkey, Sept. 22-25, 2008. (Acceptance ratio: 26/123=**21%**)

Soyoung Park, Cliff C. Zou. "Reliable Traffic Information Propagation in Vehicular Ad-Hoc Networks," *IEEE Sarnoff Symposium*, Apr. 28-30, NJ, 2008 (invited paper).

Sherri Sparks, Ryan Cunningham, Shawn Embleton, Cliff C. Zou. "Automated Vulnerability Analysis: Leveraging Control Flow for Evolutionary Input Crafting", *23rd Annual Computer Security*

Applications Conference (ACSAC), p. 477-486, Miami Beach, Florida, Dec. 10-14, 2007. (Acceptance ratio: 40/191=**21%**) **Best Student Paper Award**

Jerome Harrington, Corey Kuwanoe, Cliff C. Zou. "A BitTorrent-Driven Distributed Denial-of-Service Attack", *3rd International Conference on Security and Privacy in Communication Networks (SecureComm)*, Nice, France, Sept. 17-20, 2007. (Acceptance ratio 31/119=**26%**)

Ping Wang, Sherri Sparks, and Cliff C. Zou, "An Advanced Hybrid Peer-to-Peer Botnet", *USENIX Workshop on Hot Topics in Understanding Botnets (HotBots)*, Cambridge, MA, April 10th, 2007. (Acceptance ratio: 11/32=**34.4%**)

Jingfei Kong, Cliff C. Zou, and Huiyang Zhou, "Improving Software Security via Runtime Instruction-Level Taint Checking", *Workshop on Architectural and System Support for Improving Software Dependability* (ASID), October, 2006.

Cliff C. Zou and Ryan Cunningham. "Honeypot-Aware Advanced Botnet Construction and Maintenance," in the *International Conference on Dependable Systems and Networks* (DSN), June 25-28, Philadelphia, 2006 (Acceptance ratio: 34/187=**18.2%**).

David Dagon, Cliff C. Zou, and Wenke Lee. "Modeling Botnet Propagation Using Time Zones," in *Proceedings of 13th Annual Network and Distributed System Security Symposium (NDSS)*, p. 235-249, Feb. 2-5, 2006. San Diego, CA, U.S. (Acceptance ratio: 17/127 = **13.4%**).

Cliff C. Zou, Nick Duffield, Don Towsley, and Weibo Gong. "Adaptive Defense Against Various Network Attacks," in *Proceedings of SRUTI: Steps to Reducing Unwanted Traffic on the Internet*, p. 69-75, July 7-8, 2005. Boston, MA, U.S. (Acceptance ratio: 13/35=**37.1%**).

Cliff C. Zou, Don Towsley, Weibo Gong, and Songlin Cai. "Routing Worm: A Fast, Selective Attack Worm based on IP Address Information," in *Proceedings of 19th ACM/IEEE/SCS Workshop on Principles of Advanced and Distributed Simulation (PADS'05)*, p. 199-206, June 1-3, 2005. Monterey, CA, U.S. (**Best Paper Runner-up**, Acceptance ratio: 22/46=**48%**).

Cliff C. Zou, Don Towsley, and Weibo Gong. "Email Worm Modeling and Defense," in *Proceedings of 13th International Conference on Computer Communications and Networks* (ICCCN'04), p. 409-414, Oct. 11–13, 2004. Chicago, IL, U.S. (**Best Paper Runner-up**, Acceptance ratio: 73/207=**35.3%**).

Cliff C. Zou, Lixin Gao, Weibo Gong, and Don Towsley. "Monitoring and Early Warning for Internet Worms," in *Proceedings of 10th ACM Conference on Computer and Communication Security* (CCS'03), p. 190-199, Oct. 27–31, 2003. Washington DC, U.S. (Acceptance ratio: 35/253=**13.8%**).

Cliff C. Zou, Weibo Gong, and Don Towsley. "Worm Propagation Modeling and Analysis under Dynamic Quarantine Defense," in *Proceedings of ACM/CCS Workshop on Rapid Malcode* (WORM'03), p. 51-60, Oct. 27, 2003. Washington DC, U.S. (Acceptance ratio: 10/25=**40%**).

Cliff C. Zou, Weibo Gong, and Don Towsley. "Code Red Worm Propagation Modeling and Analysis," in *Proceedings of 9th ACM Conference on Computer and Communication Security* (CCS'02), p. 138-147, Nov. 18–22, 2002. Washington DC, U.S. (Acceptance ratio: 27/153=**17.6%**).

Invited Presentations
Invited talks entitled "Modeling, Analysis, and Mitigation of Internet Worm Attacks":

- AT&T Labs Research, Florham Park, NJ, December 9, 2003
- CS Dept. Colloquium, Worcester Polytechnic Institute (WPI), MA, January 16, 2004
- College of Computing, Georgia Institute of Technology, GA, October 11, 2005
- University of Science & Technology of China, January 2006

Invited talks entitled "The Next Generation of Botnet Attacks":

- University of Massachusetts, Amherst, January 22, 2009.
- University of Science and Technology of China, China, Apr. 27, 2010.

Patent
- US Patent 7587761: Adaptive Defense Against Various Network Attacks, September 8, 2009.

Grants and Contracts

- NSF REU supplement grant for CNS-0627318, single **PI** ($16,000, 09/2009 - 08/2010).
- Intel Research Fund: "Automated Vulnerability Analysis: Leveraging Control Flow for Evolutionary Input Crafting," single **PI**, $53,465 (2007 - 2010).
- NSF Cyber Trust program **CNS-0627318**: "Collaborative Research: CT-ISG: Modeling and Measuring Botnets". **PI**, my share: $175,000 (Aug. 2006 - Aug. 2009).
- UCF In-House Research Grants, single PI, my share: $7,500 (2005-2006).

PROFESSIONAL ACTIVITIES

- Senior Member of IEEE
- Member of ACM
- **NSF Panelist** on NeTS Small Security Panel (P111391), April 4-5, 2011.
- Program Co-Chair:
  - Second IEEE LCN workshop on network security, 2006.
  - 5th IEEE International Conference on Malicious and Unwanted Software (Malware), 2010.
  - IEEE International Workshop on Cyberspace Safety and Security (CSS), 2011.
- Program Committee Member:
  - International Conference on Malicious and Unwanted Software (Malware), 2011.
  - International Conference on Security and Privacy in Communication Networks (SecureComm), 2011.
  - IEEE/IFIP International Symposium on Trusted Computing and Communications (Trustcom), 2011.
  - FTRA International Conference on Computer Science and its Applications (CSA-11), 2011.
  - International Conference on Data Communication Networking (DCNET), 2011.
  - IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks

(WoWMoM), 2011.

- International Conference on Computer Communication Networks (ICCCN), 2011.

- IEEE Global Communications Conference (GLOBECOM), 2011.

- FTRA International Conference on Secure and Trust Computing, data management, and Applications (STA), 2011.

- International Conference on Parallel and Distributed Systems (ICPADS), 2010.

- IEEE Military Communication Conference (Milcom), 2010.

- International Conference on Network & System Security (NSS), 2010.

- 5th International Conference on Mathematical Methods, Models, and Architectures for Computer Networks Security (MMM-ACNS), 2010.

- 6th IEEE/IFIP International Symposium on Trusted Computing and Communications (Trustcom), 2010.

- IEEE International Conference on Communications (ICC), 2010.

- International Wireless Communications and Mobile Computing Conference (IWCMC), 2009, 2010.

- Fourth International Conference on Communications and Networking in China (CHINACOM), 2009.

- International Conference on Security and Privacy in Communication Networks (SecureComm), 2009, 2008.

- 1st IEEE International Workshop on Network Security and Privacy (NSP), 2008.

- International Swarm Intelligence & Other Forms of Malware Workshop (Malware), 2008, 2009.

- Pacific Asia Workshop on Cybercrime and Computer Forensics (PACCF), 2008.

- International Conference on Network & System Security (NSS), 2010, 2009, 2008.

- IEEE Global Communications Conference (GLOBECOM), 2007.

- International Conference on Embedded Software and Systems (ICESS), 2007.

- 4th ACM Workshop on Rapid Malcode (WORM), 2006.

- Conference Session Chair:

  - International Conference on Security and Privacy in Communication Networks (SecureComm), 2008.

  - International Swarm Intelligence & Other Forms of Malware Workshop (Malware), 2008.

  - 4th Workshop on Rapid Malcode (WORM'06), 2006.

- Local Arrangement Co-Chair:

  - 11th International Conference on Ubiquitous Computing (Ubicomp), 2009.

  - IEEE International Conference on Network Protocols (ICNP), 2008.

  - IEEE/ACM Symposium on Architectures for Networking and Communications Systems

(ANCS), 2007.

Service as Editor for Journals

- Editorial Board Member: International Journal of Ad Hoc and Ubiquitous Computing (IJAHUC)
- Associate Editor: Wiley Journal of Security and Communication Networks (SCN)

RECOGNITION AND AWARDS

- Received UCF-Teaching Incentive Program (UCF-TIP) Award, May 2013.
- Cliff Zou got "Outstanding Contribution Award" for the program co-chair work on conference Malware 2010.
- Our undergraduate research project "Personal Medication Monitor" won the first price ($1500) in the *first annual UCF Inventing Entrepreneurs Innovation Competition*, Mar. 2010. It is reported by UCF News: http://today.ucf.edu/winners-of-inaugural-innovation-competition-named/
- Our work and paper "Honeypot detection in advanced botnet attacks" published in International Journal of Information and Computer Security 2010, 4(1), pp. 30-51 have been reported by *EurekAlert!* News Service, and by *The Register* (one of the world's biggest online tech publications), respectively at:

  http://www.eurekalert.org/pub_releases/2010-02/ip-hth022610.php

  http://www.theregister.co.uk/2010/03/02/honeypot_anti_security_countermeasures/
- I provided comments about botnet attack on WDBO-AM Radio news broadcasted on 03/02/2010. The audio is at: http://www.cs.ucf.edu/~czou/research/botnets-radio.MP3
- Our paper in Milcom'09 reported by a conference preview article published in *IEEE communication magazine*, October 2009, page 22.
- The SMM rootkit work (paper published in Securecomm'08) was reported by *PCWorld* Magazine (05/09/2008).
- The SMM rootkit paper published in Securecomm'08 is invited for SCN journal submission as one of the best papers from the conference.
- The paper published in conference ACSAC 2007 was awarded with "***Best Student Paper Award***."
- The research work in NDSS'06 paper "Modeling Botnet Propagation Using Time Zones" was reported by the New Scientist Magazine, Mar. 4, 2006 189(2541), pg. 32.
- **Best Paper Runner-up** in conference PADS'05.
- **Best Paper Runner-up** in conference ICCCN'04.
- Interviewed by National Public Radio (NPR) on my research "dynamic quarantine of Internet worm" (by Correspondent Larry Abramson), September 2003.