Resume

Zahid Anwar

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SUMMARY

- More than **12 years** of experience in applying **machine learning** and **security analytics** to systems of systems such as **critical cyber-infrastructures**, **IoT**, **cloud**, **data-center networks**, **operating systems**, **web** and **big datasets**.
- Solid experience in **datacenter and SAN deployment** and **private cloud setup**, **cloud migration**, **data center networking** and **SDN**, **AWS cloud** and **IoT application** development.
- Cybersecurity and secure coding experience in object oriented and component based analysis, design patterns, testing, consultation and implementation of software at companies such as **IBM**, **Intel**, **Motorola** and **NCSA**.
- **PhD in cybersecurity** from **University of Illinois in Urbana-Champaign** specializing in quantitative and qualitative analysis of control network of **critical cyber-infrastructures** such as the **electric power grid** and **energy sectors**.
- Strong analytical, problem solving, interpersonal and communication skills.

NEWS, MEDIA AND RECOGNITIONS

KVLY	Cybersecurity best practices. link	**Oct 22, 2021**
The Hill	Warren's ransomware bill victimizes targets to collect data link	**Oct 13, 2021**
The Hill	Extreme measures for recovering Afghans' data. link	**Sep 17, 2021**
Authority Magazine	5 Things to optimize your company's approach. link	**Dec 11, 2020**
KMOX	'SIM Swapping'. link	**Sep 1, 2020**
Security Magazine	Fighting COVID-19-Related Cybercrime link	**June 17, 2020**
KMOV CBS	How charging your phone can open you up to hackers. link	**Nov 8, 2019**
KMOV CBS	Cybersecurity Jobs. link	**Nov 8, 2019**
Security Magazine	A New Framework for Preventing Cyber Attacks. link	**July 1, 2019**
Safety.com	Why Hackers Target Smart Homes and Tips To Protect Yours. link	**June 4, 2019**
Fox News	Zahid on World Backup Day: How safe is your data? link	**Mar 29, 2019**
Digital Guardian	What will the biggest cybersecurity risks in 2019? link	**Dec 17, 2018**
Fox News	Cybersecurity expert cautions 'be aware of cyber attacks'. link	**Oct 16, 2018**
Emerson	Excellence in Teaching Award	**Nov 17, 2019**
National CyberWatch Center	Mention in Innovations in Cybersecurity Education. link	**Sep 9, 2019**
National Security Agency (NSA)	Science of Security Certificate of Recognition.	**Sep 14, 2015**
U of Illinois Urbana-Champaign	Abbasi Fellowship for Research Excellence	**Apr 25, 2008**
Intel	Corporate Services Appreciation Award	**Dec 27, 2006**

TECHNICAL SKILLS

Cloud AWS (Elastic Beanstalk, EC2, RDB, IoT Core, ChatBot), Azure, Cloud Foundry, Eucalyptus Cloud, OpenStack
Information Security ProDiscover, FTK, Hex Workshop, Autopsy, Bro, AlienVault OSSIM, Snort, Webgoat, ModSecurity, FIPS, AES, DES/3DES, SHA, MD5, X.509, Kerberos, IPSec, NVD, CWE, CVE, Formal Modeling (Petri Nets, SPIN, Z3 Event-B)
Penetration testing Metasploit, Kali, JTR, hashcat, GNU Radio, TempestSDR, IDA Pro, hping3, SMAC, XArp, Promqry, Cain & Able, NMap, OpenVAS, Burp proxy, Mobile Security Framework (MobSF), Genymotion, Drozer
Hardware Security USB RubberDucky, Wifi Pineapple, HackRF, SDR Sharp, GNU Radio, FTDI V2DIP1-32 USB Write Blocker, bash bunny
Threat Intelligence Splunk, STIXViz, ThreatConnect, OpenIOC, YARA, ATT&CK MITRE
SCADA Systems Security PLC, DNP3, Modbus, Powerworld Simulator, remote terminal units (RTUs), intelligent electronic devices (IEDs), NERC CIP, IEC 61850
Cyber-defense Founder and faculty advisor to FBU Hackers' club. The club has participated in several cyberdefence competitions since its inception. Secured 2nd place at CANSec 2018 and 1st place in FBU CTF 2019.

Machine Learning TensorFlow, Weka, CoreNLP, Natural Language Toolkit (NLTK), Apache Lucene, Elasticsearch
Programming C/C++, Java, Python, Prolog, x86/MIPS, ASP.NET, R, Matlab, Perl, Android SDK, Smalltalk/Squeak, OCaml, Tcl/Tk, MPI
Software Engineering Agile, XP & Scrum, TDD, UML, design patterns, Planning, Estimation, Refactoring, Risk Analysis, ERD, DFD, Flow charting, DevOps, JUnit, Log4J, Jasmine, SVN/CVS/Git, Rational Rose, Bugzilla, SOA, Microservices arch, Valgrind, VTune, Gradle, Ant, Maven, Eclipse, Intellij
Data Hibernate, SQL, H2, MySQL, PostGreSQL, MongoDB, Oracle, Lucene, Jena, Hadoop, Protégé, SPARQL, Hive, Elastic Search, Matplotlib, Pandas, Spagobi
Networking Wireshark, Omnet++, TCP/IP, Network Simulator (NS), OpenFlow, Floodlight controller, mininet
Operating Systems Linux, Cavium Octeon, VxWORKS, Android
Web Development Spring, HTML5, CSS, JavaScript, JSON, Tomcat, jQuery, NodeJS, PHP, Restful API, JWT, RESTful API, JMeter
IoT Arduino, Raspberry Pi, alljoyn, simpleIoTSimulator, LabVIEW, Particle, TensorFlow, Tessel 2, Node-RED, TJBot, Coral dev board tensorflow,Oculus dev, Unity 3D, Verilog

PROFESSIONAL EXPERIENCE

- **North Dakota State University, Fargo, ND. USA** *Associate Professor and Challey Scholar* link **Aug 2021- toDate**
  Teach graduate and undergraduate courses in cybersecurity law and policy and data-driven security. Conduct research in ransomware detection and mitigation. Designed a simulation framework for analysis of supply chain attacks.

- **Fontbonne University, St. Louis, MO. USA** *Associate Professor in Cyber Security.* **Aug 2016- May 2021**
  Taught graduate and undergraduate courses in cybercrime and policy, network security, cloud security, reverse engineering, applied cryptography, cloud and IoT. Secured internal and industry funding from Emerson and Gateway to Innovation and set up an IoT security lab. Developed pen testing modules for USB hijacking, tempest emanations, evil portal and man-in-the middle proxy attacks. Developed software and hardware based USB write blockers for digital forensics. Designed a JSON based regular expression language for pattern matching and security analysis of streaming sensor data for IoT devices. Developed a security framework for mitigating link flooding attacks in Software Defined Networks (SDN). Conducted a study and POC on privacy issues in VR headsets.

  - **Capital Innovators, St. Louis, MO. USA** *Cyber-security Mentor (part-time)* link **Aug 2019- toDate**
    Mentor startups in cyber-security laws, standards, infosec policy development and cyber threat intelligence.

- **University of North Carolina Charlotte, USA** *Associate Faculty and Senior Researcher* **Sep 2014 – July 2016**
  Taught coursework in critical infrastructure protection, introduction to web development. Conducted cyber threat intelligence and data analytics using open threat repositories including hail-a-taxii, VERIS and IMPACT. Utilized the cyber kill chain and the diamond modules on STIX, OpenIOC and YARA based structured threat indicators. Developed a machine learning based framework to extract indicators from security blogs using NLP for attack prediction and threat actor attribution. Extended the ATT&CK MITRE dataset for the open source community.

- **National University of Sci & Tech (NUST), Pakistan** *Assistant Professor & Director Mobile App Lab* **Sep 2009-Sep 2014**
  Deployment of Eucalyptus and OpenStack Cloud solutions. Designed the CloudNetSim++ framework for cloud security simulation. Designed a security framework for establishing trust and for digital forensics of IaaS cloud deployments. Performed threat analysis of Cloudlet deployments in wifi networks. Performed security analytics using Hadoop MapReduce, Hive and HBase. Developed a semantic based web application firewall along with a cluster based highly available load balancer for defense against for application attacks. Developed Securage – a secure file vault for Android environments and an antimalware application for detecting roving spy bugs to mitigate corporate espionage.

  - **CERN European Nuclear Research, Genève, Switzerland.** *Researcher* (*part-time*) **Summer 2014**
    Designed and developed a hardware module that operated at line speed for event detection in the CMS (Compact Muon Selenoid) one of the sub-projects of the mega LHC (Large Hadron Collider) project.

- **xFlow Research, Sunnyvale, California & Pakistan** *Team Lead*. (*part-time*) **Sep 2009- Jun 2014**
  Managed a team of 12 developers working on the design and development of a Cavium Octeon port of the Valgrind project. Valgrind is a dynamic code analysis framework that performs secure code analysis such as memory leak detection, cache and data-flow taint analysis.

- **Young Scientist Program China Association of Sci & tech, Beijing** *Researcher* (*part-time*) **Summer 2012**
  Collaboration on energy security with researchers at the North China Electric Power University and the Beijing University of Posts and Telecommunications.

- **Engineering and Computer Science Concordia University, Montreal, Canada** *Postdoc Fellow* **Dec 2008- Apr 2009**
  Managed a team of developers for the Science Studio project- A remote instrument control and experiment management system to control and observe research carried out at Canada's National Synchrotron Laboratory.

- **Information Trust Institute, University of Illinois at Urbana-Champaign.** *Researcher* **Jan 2003 – Dec 2008**
  Development of formal models and tools to automate the analysis of the security properties of control networks as part of the NSF funded Trustworthy Infrastructure for the PowerGrid (TCIPG) project. Simulated SCADA configurations and operating procedures for the electric power grid to quantify vulnerabilities and suggest controls. Extended J-Sim (a composable and extensible network simulation and emulation environment) to include representative security mechanisms including packet sniffers, IPsec, firewalls and models of various intrusion/attack scenarios.

  - **Intel, Portland, OR** *Software developer Intern* **Aug 2006- Mar 2007**
    Worked with a team to design a software licensing and remote product activation security solution for Intel's software products and compatible with multiple combinations of Intel hardware architectures.

  - **IBM T. J. Watson, NY** *Software developer intern* **Summer 2006**
    Designed security features for SoulPad- IBM's mobile operating system solution that lets users migrate applications between heterogeneous computing devices.

  - **Motorola Chicago, IL** *Software developer intern* **Summer 2005**
    Designed a security framework for the STREET (SysTem for Remote End-to-End Testing) project. STREET is designed to optimize wireless signal strength and performance in real-time by querying call statistics from end-users' devices.

  - **National Center Supercomputing Applications, Urbana, IL** *Cybersecurity Engineer* **Apr 2004-Apr 2005**
    Developed security tools for survivable web services, application layer multicast group communication, VoIP, social computing and key management.

- **Center for Advanced Research in Engineering, Pakistan** *Software design engineer* **Jun 2001- Dec 2002**
  Responsible for design, development and maintenance of the companies VoIP stacks product line including H.248, ISDN PRI, Automatic Call Distribution System (ACD), SS7, RTP, SIP and media gateways.

EDUCATION

PhD Computer Science **University of Illinois, Urbana-Champaign, USA** **Sep 2005-Dec 2008**
MS Computer Science **University of Illinois, Urbana-Champaign, USA** **Jan 2003 -Apr 2005**
BS Computer Engineering from **Ghulam Ishaq Khan Institute of Eng. Sci & Tech, Pakistan** **Aug 1997-Apr 2001**

CERTIFICATIONS

CompTIA PenTest+
CompTIA Security+
CompTIA Network Vulnerability Assessment Professional
AWS Certified Cloud Solutions Architect
Cyber Security Process Ctrl Systems Summer School, Info Trust Institute**,** U of Illinois.
Control Systems Cyber-Security Professional Certification, Iowa State University, USA

PUBLICATIONS

Peer Reviewed Journals

1 Raihan Ur Rasool, Khandakar Ahmed, **Zahid Anwar**, Hua Wang, Usman Ashraf, and Wajid Rafique. Cyberpulse++: A machine learning-based security framework for detecting link flooding attacks in software defined networks. *International Journal of Intelligent Systems*, 2021

2 Syed Luqman Shah, Irshad Ahmed Abbasi, Alwalid Bashier Gism Elseed, Sikandar Ali, **Zahid Anwar**, Qasim Rajpoot, and Maria Riaz. Tamec: Trusted augmented mobile execution on cloud. *Scientific Programming*, 2021

3 Raihan ur Rasool, Hua Wang, Usman Ashraf, Khandakar Ahmed, **Zahid Anwar**, and Wajid Rafique. A survey of link flooding attacks in software defined network ecosystems. *Journal of Network and Computer Applications*, 172:102803, 2020

4 Umara Noor, **Zahid Anwar**, Jörn Altmann, and Zahid Rashid. Customer-oriented ranking of cyber threat intelligence service providers. *Electronic Commerce Research and Applications*, 41, 2020

5 Zafar Iqbal and **Zahid Anwar**. Scerm—a novel framework for automated management of cyber threat response activities. *Future Generation Computer Systems*, 2020

6 Raihan Ur Rasool, Usman Ashraf, Khandakar Ahmed, Hua Wang, Wajid Rafique, and **Zahid Anwar**. Cyberpulse: A machine learning based link flooding attack mitigation system for software defined networks. *IEEE Access*, 7:34885–34899, 2019

7 Saqib Kazmi, Mehreen Ahmed, Rafia Mumtaz, and **Zahid Anwar**. Spatiotemporal clustering and analysis of road accident hotspots by exploiting gis technology and kernel density estimation. *The Computer Journal*, 2019

8 Asad Waqar Malik, Imran Mahmood, Nadeem Ahmed, and **Zahid Anwar**. Big data in motion: A vehicle-assisted urban computing framework for smart cities. *IEEE Access*, 7:55951–55965, 2019

9 Umara Noor, **Zahid Anwar**, Tehmina Amjad, and Kim-Kwang Raymond Choo. "A Machine Learning-based FinTech Cyber Threat Attribution Framework using High-level Indicators of Compromise". *Future Generation Computer Systems*, 96:227–242, 2019

10 Umara Noor, **Zahid Anwar**, Asad Waqar Malik, Sharifullah Khan, and Shahzad Saleem. "A Machine Learning Framework for investigating Data Breaches based on Semantic Analysis of Adversary's Attack Patterns in Threat Intelligence Repositories". *Future Generation Computer Systems*, 95:467–487, 2019

11 Raihan ur Rasool, Maleeha Najam, Hafiz Farooq Ahmad, Hua Wang, and **Zahid Anwar**. "A Novel JSON Based Regular Expression Language For Pattern Matching in the Internet of Things". *Ambient Intelligence and Humanized Computing*, 10(4):1463–1481, May 2018

12 Imran Khan, Habib ur Rehman, Mohammad Hussein Fayiz Al-khatib, **Zahid Anwar**, and Masoom Alam. "A Thin Client Friendly Trusted Execution Framework for Infrastructure-as-a-Service Clouds". *Future Generation Computer Systems*, 89:239 – 248, 2018

13 Asad W Malik, Raihan ur Rasool, **Zahid Anwar**, and Shahid Nawaz. "A Generic Framework for Application Streaming Services". *Computers & Electrical Engineering*, 66:149–161, 2018

14 Mujahid Mohsin, **Zahid Anwar**, Farhat Zaman, and Ehab Al-Shaer. "IoTChecker: A Data-driven Framework for Security Analytics of Internet of Things Configurations". *Computers & Security*, 70:199–223, 2017

15 Mujahid Mohsin, Muhammad Usama Sardar, Osman Hasan, and **Zahid Anwar**. "IoTRisk-Analyzer: A Probabilistic Model Checking Based Framework for Formal Risk Analytics of the Internet of Things". *IEEE Access*, 5:5494–5505, 2017

16 Sara Qamar, **Zahid Anwar**, Mohammad Ashiqur Rahman, Ehab Al-Shaer, and Bei-Tseng Chu. "Data-driven Analytics for Cyber-threat Intelligence and Information Sharing". *Computers & Security*, 67:35–58, 2017

17 Asad W Malik, Kashif Bilal, SU Malik, **Zahid Anwar**, Khurram Aziz, Dzmitry Kliazovich, Nasir Ghani, Samee U Khan, and Rajkumar Buyya. "CloudNetSim++: A GUI Based Framework for Modeling and Simulation of Data Centers in OMNeT++". *IEEE Transactions on Services Computing*, 10(4):506–519, 2017

18 Imran Khan, **Zahid Anwar**, Behzad Bordbar, Eike Ritter, and Habib ur Rehman. "A Protocol for Preventing Insider Attacks in Untrusted Infrastructure-as-a-Service Clouds". *IEEE Transactions on Cloud Computing*, 6:942 – 954, 2016

19 Usman Shaukat, Ejaz Ahmed, **Zahid Anwar**, and Feng Xia. "Cloudlet Deployment in Local Wireless Networks: Motivation, Architectures, Applications, and Open Challenges". *Journal of Network and Computer Applications (JNCA)*, 62:18–40, 2016

20 Hira Asghar, **Zahid Anwar**, and Khalid Latif. "A Deliberately Insecure RDF-based Semantic Web Application Framework for Teaching SPARQL/SPARUL Injection Attacks and Defense Mechanisms". *Computers & Security*, 58:63–82, 2016

21 Usman Shaukat and **Zahid Anwar**. "A Fast and Scalable technique for Constructing Multicast Routing Trees with Optimized Quality of Service using a Firefly based Genetic Algorithm". *Multimedia Tools and Applications*, 75(4):2275–2301, 2016

22 Zafar Iqbal and **Zahid Anwar**. "Ontology Generation of Advanced Persistent Threats and their Automated Analysis". *NUST Journal of Engineering Sciences (NJES)*, 9(2):68–75, 2016

23 Mujahid Mohsin, **Zahid Anwar**, and Farhat Zaman. "Towards a Generic Model for Risk Analysis of the Internet of Things (IoT)". *NUST Journal of Engineering Sciences (NJES)*, 9(2):42–49, 2016

24 Saman Iftikhar, M Kamran, and **Zahid Anwar**. "RRW-A Robust and Reversible Watermarking Technique for Relational Data". *IEEE Transactions on Knowledge and Data Engineering*, 27(4):1132–1145, 2015

25 Naila Karim, Khalid Latif, **Zahid Anwar**, Sharifullah Khan, and Amir Hayat. "Storage schema and ontology-independent SPARQL to HiveQL translation". *Supercomputing*, 71(7):2694–2719, 2015

26 **Zahid Anwar** and Waqas Ahmad Khan. "Guess Who Is Listening In To the Board Meeting: On the Use of Mobile Device Applications as Roving Spy Bugs". *Security and Communication Networks*, 8(16):2813–2825, 2015

27 Saman Iftikhar, M Kamran, and **Zahid Anwar**. "A Survey on Reversible Watermarking Techniques for Relational Databases". *Security and Communication Networks*, 8:2580–2603, 2015

28 Saman Iftikhar, Sharifullah Khan, **Zahid Anwar**, and Muhammad Kamran. "GenInfoGuard-A Robust and Distortion-Free Watermarking Technique for Genetic Data". *PloS one*, 10(2), 2015

29 Abdul Razzaq, Khalid Latif, H. Farooq Ahmad, Ali Hur, **Zahid Anwar**, and Peter Charles Bloodsworth. "Semantic Security against Web Application Attacks". *Information Sciences*, 254:19 – 38, 2014

30 Abdul Razzaq, **Zahid Anwar**, H. Farooq Ahmad, Khalid Latif, and Faisal Munir. "Ontology for Attack Detection: An Intelligent Approach to Web Application Security". *Computers and Security*, 45:124 – 146, 2014

31 **Zahid Anwar** and Asad Waqar Malik. "Can a DDoS Attack Meltdown My Data Center? A Simulation Study and Defense Strategies". *IEEE Communications Letters*, 18(7):1175–1178, 2014

32 Saba Maqbool, Sana Maqbool, **Zahid Anwar**, and Asad. W . Malik. "In depth Analysis of Volunteer Computing Frameworks: A Case Study". *International Journal of Business and Social Sciences*, 2(3):42–56, 2014

33 **Zahid Anwar**, Mirko Montanari, Alejandro Gutierrez, and Roy H Campbell. "Budget Constrained Optimal Security Hardening of Control Networks for Critical Cyber-Infrastructures". *International Journal of Critical Infrastructure Protection*, 2(1):13–25, 2009

Book Chapters

34 **Zahid Anwar** and Roy Campbell. *"Automated Assessment of Critical Infrastructures for Compliance to CIP Best Practices"*, volume 290 of *IFIP Advances in Information and Communication Technology*, chapter 11, pages 173–187. Springer, 2008

Peer-Reviewed Conference Proceedings

35 Yumna Ghazi, **Zahid Anwar**, Rafia Mumtaz, Shahzad Saleem, and Ali Tahir. "A Supervised Machine Learning Based Approach for Automatically Extracting High-Level Threat Intelligence from Unstructured Sources". In *Frontiers of Information Technology*, 2018

36 Zafar Iqbal, **Zahid Anwar**, and Rafia Mumtaz. "STIXGEN - A novel framework for Automatic Generation of Structured Cyber Threat Information". In *Frontiers of Information Technology*, 2018

37 Umara Noor, **Zahid Anwar**, and Zahid Rashid. "An Association Rule Mining Based Framework for Profiling Regularities in Tactics, Techniques and Procedures of Cyber Threat

Actors". In *IEEE International Conference on Smart Computing and Electronic Enterprise*, 2018

38 Amna Shahzadi and **Zahid Anwar**. "Cyber Security Legislature: Challenges and Remedies". In *International Symposium on Advances in Computer & Information Sciences (ISACIS)*, pages 1–8. Pakistan Institute of Engineering and Applied Sciences, 2017

39 Mujahid Mohsin and **Zahid Anwar**. "Where to Kill the Cyber Kill-Chain: An Ontology-Driven Framework for IoT Security Analytics". In *IEEE International Conference on Frontiers of Information Technology (FIT)*, 2016

40 Rana Khattak and **Zahid Anwar**. "D3TAC: Utilizing Distributed Computing for DDoS Attack Traffic Analysis on the Cloud". In *IEEE International Multi-Topic Conference (INMIC)*, 2016

41 Mujahid Mohsin, **Zahid Anwar**, Ghaith Husari, Mohammad Rahman, and Ehab Al-Shaer. "IoTSAT: A Formal Framework for Security Analysis of the Internet of Things". In *IEEE Conference on Communications and Network Security (CNS)*, Philadelphia, Pennsylvania, 2016

42 David Samuel Bhatti, Nazar Abbas Saqib, and **Zahid Anwar**. "SCEAMS: Secure Corporate Environment Adhered to Mobile Smartphones". In *Sixth International Conference on Innovative Computing Technology (INTECH)*, pages 561–566, Aug 2016

43 Saman Iftikhar, **Zahid Anwar**, and Muhammad Kamran. "A Novel and Robust Fingerprinting Technique for Digital Data based on Genetic Algorithm". In *IEEE Conference on High-capacity Optical Networks and Emerging Technologies (HONET)*, 2014

44 Ubaid Ur Rehman, Amir Ali, and **Zahid Anwar**. "secCloudSim: Secure Cloud Simulator". In *IEEE International Conference on Frontiers of Information Technology (FIT)*, 2014

45 Mahmood Ahmad, **Zahid Anwar**, and Sungyoung Lee. "Privacy Preserving e-Health Data Sharing in the Cloud-Extended Utilization of Anonymization with Random Effect". *Korea Information Science Society 40th Annual General Meeting and Fall Conference*, 2013

46 Mudassir Masood, **Zahid Anwar**, S Ali Raza, and Ali Hur. "EDoS Armor: A Cost Effective Economic Denial of Sustainability Attack Mitigation Framework for E-Commerce Applications in Cloud Environments". In *IEEE International Multi Topic Conference (INMIC)*, 2013

47 **Zahid Anwar**, Marya Sharf, Essam Khan, and Muhammad Mustafa. "VG-MIPS: A Dynamic Binary Instrumentation Framework for Multi-Core MIPS Processors". In *IEEE International Multi Topic Conference (INMIC)*, 2013

48 Umara Noor, **Zahid Anwar**, Yasir Mehmood, and Waseem Aslam. "TrustBook: Web of Trust Based Relationship Establishment in Online Social Networks". In *IEEE International Conference on Frontiers of Information Technology (FIT)*, 2013

49 Mohsin Ikram, Qurrat-Ul-Ain Babar, **Zahid Anwar**, and Asad Waqar Malik. "GSAN: Green Cloud-Simulation for Storage Area Networks". In *IEEE International Conference on Frontiers of Information Technology (FIT)*, 2013

50 Sidra Shahbaz, Asiah Mahmood, and **Zahid Anwar**. "SOAD: Securing Oncology EMR by Anonymizing DICOM Images". In *IEEE International Conference on Frontiers of Information Technology (FIT)*, 2013

51 Hirra Anwar, Sarah Masood, and **Zahid Anwar**. "PISA: Improving the Pseudo-Randomness of Pen-and-Paper ciphers based on the Solitaire algorithm". In *IEEE International Multitopic Conference (INMIC)*, 2012

52 Ali Ahmad, **Zahid Anwar**, Ali Hur, and Hafiz Farooq Ahmad. "Formal reasoning of Web Application Firewall Rules through Ontological Modeling". In *International Multitopic Conference (INMIC)*, 2012

53 Usman Shaukat Qurashi and **Zahid Anwar**. "AJAX based attacks: Exploiting Web 2.0". In *IEEE International Conference on Emerging Technologies (ICET)*, 2012

54 Saif Ur Rehman, Raihan Ur Rasool, M Sohaib Ayub, Saeed Ullah, Aatif Kamal, Qasim M Rajpoot, and **Zahid Anwar**. "Reliable Identification of Counterfeit Medicine using Camera Equipped Mobile Phones". In *IEEE High Capacity Optical Networks and Enabling Technologies (HONET)*, pages 273–279, 2011

55 Imran Khan, Habib-ur Rehman, and **Zahid Anwar**. "Design and Deployment of a Trusted Eucalyptus Cloud". In *IEEE International Conference on Cloud Computing (CLOUD)*, pages 380–387, 2011

56 Zafarullah, Faiza Anwar, and **Zahid Anwar**. "Digital Forensics for Eucalyptus". In *IEEE Conference on Frontiers of Information Technology (FIT)*, pages 110–116, 2011

57 Rana Khattak, Shehar Bano, Shujaat Hussain, and **Zahid Anwar**. "DOFUR: DDoS Forensics Using MapReduce". In *IEEE Conference on Frontiers of Information Technology (FIT)*, pages 117–120, 2011

58 Rahat Masood, Ume Ghaiza, and **Zahid Anwar**. "SWAM: Stuxnet Worm Analysis in Metasploit". In *IEEE Conference on Frontiers of Information Technology (FIT)*, pages 142–147, 2011

59 Mohammad Ali, Humayun Ali, and **Zahid Anwar**. "Enhancing Stealthiness & Efficiency of Android Trojans and Defense Possibilities (EnSEAD)-Android's Malware Attack, Stealthiness and Defense: An Improvement". In *IEEE Conference on Frontiers of Information Technology (FIT)*, pages 148–153, 2011

60 Muhammad Afzal, Maqbool Hussain, Mahmood Ahmad, and **Zahid Anwar**. "Trusted framework for Health Information Exchange". In *IEEE Conference on Frontiers of Information Technology (FIT)*, pages 308–313, 2011

61 Khalid Hafeez, Muddassar Masood, Owais Malik, and **Zahid Anwar**. "LASSP: A Logic Analyzer for Tweaking Snort Security and Performance". In *IEEE International Conference on Emerging Technologies (ICET)*, pages 240–245, 2010

62 Shujaat Hussain, Mohsin Abbass, Owais Malik, and **Zahid Anwar**. "SLOGS: Security through predicate LOGic in SSH". In *IEEE International Conference on Emerging Technologies (ICET)*, pages 256–260, 2010

63 Zahid Rashid, Abdul Basit, and **Zahid Anwar**. "TRDBAC: Temporal Reflective Database Access Control". In *IEEE International Conference on Emerging Technologies (ICET)*, 2010

64 **Zahid Anwar**, Zhiguo Wang, Chun Wang, Dan Ni, Yaofeng Xu, and Yuhong Yan. "An Integer Programming Model and Heuristic Algorithm for Automatic Scheduling in Synchrotron Facilities". In *IEEE International Conference on Systems, Man and Cybernetics (SMC)*, pages 4048–4053, 2009

65 **Zahid Anwar**, Ravinder Shankesi, and Roy H Campbell. "Automatic Security Assessment of Critical Cyber-infrastructures". In *IEEE International Conference on Dependable Systems and Networks (DSN)*, pages 366–375, 2008

66 **Zahid Anwar** and Roy H Campbell. "Secure Reincarnation of Compromised Servers Using Xen Based Time-Forking Virtual Machines". In *IEEE International Conference on Pervasive Computing and Communications Workshops*, pages 477–482, 2007

67 Zhenyu Yang, Yi Cui, **Zahid Anwar**, Robert Bocchino, Nadir Kiyanclar, Klara Nahrstedt, Roy H Campbell, and William Yurcik. "Real-Time 3D Video Compression for Tele-Immersive Environments". In *Electronic Imaging 2006*. International Society for Optics and Photonics, 2006

68 **Zahid Anwar**, Jun Wang, William Yurcik, and Roy H Campbell. "SPEEDS - Small-world Privacy-Enhanced Engine for Distributed Search: Toward Enhancing Privacy Protection in P2P Social Network Communities". In *International Conference on Telecommunication Systems -Modeling & Analysis (ICTSM)*, pages 332–335. Penn State Berks Campus, 2006

69 William Yurcik, Charis Ermopoulos, Yifan Li, Chao Liu, Xin Meng, and **Zahid Anwar**. "Masquerade Detection for HPC Cluster Security: Explanatory Analysis". In *Cluster-Sec, 6th IEEE Inter Symposium on Cluster Computing & the Grid*, pages 332–335, 2006

70 **Zahid Anwar**, William Yurcik, Ralph E Johnson, Munawar Hafiz, and Roy H Campbell. "Multiple Design Patterns for Voice over IP (VoIP) Security". In *25th IEEE International Performance, Computing, and Communications Conference, 2006. IPCCC 2006.*, 2006

71 **Zahid Anwar**, Jalal Al-Muhtadi, William Yurcik, and Roy H Campbell. "Plethora: A Framework for Converting Generic Applications to run in a Ubiquitous Environment". In *IEEE Conference on Mobile and Ubiquitous Systems: Networking and Services (MobiQuitous)*, 2005

72 **Zahid Anwar**, William Yurcik, Salman Baset, Henning Schulzrinne, and Roy H Campbell. "A First Step towards Call Survivability in Cellular Networks". In *The IEEE Conference on Local Computer Networks (LCN)*, 2005

73 **Zahid Anwar**, William Yurcik, and Roy H Campbell. "A Survey and Comparison of Peer-to-Peer Group Communication Systems Suitable for Network-Centric Warfare". In *Defense and Security Symposium*, pages 33–44. International Society for Optics and Photonics, 2005

74 Ragib Hasan, **Zahid Anwar**, William Yurcik, Larry Brumbaugh, and Roy Campbell. "A Survey of Peer-to-Peer Storage Techniques for Distributed File Systems". In *IEEE International Conference on Information Technology: Coding and Computing, 2005. (ITCC)*, volume 2, pages 205–213, 2005

75 **Zahid Anwar**. "Linking PSTN to IP Networks-The Softswitch Signaling Gateway". In *IEEE International Multi Topic Conference (INMIC), 2002.*, pages 57–57, 2002

Book Reviews

76 Hossein Bidgoli. *"The Handbook of Computer Networks, 3 Volume Set"*. Wiley, 2007

Technical Reports

77 **Anwar, Zahid**, Shaya Potter, Chandra Narayanaswami, William Yurcik, Carl Gunter, and Roy H Campbell. "Detecting and Mitigating Denial-of-Service Attacks on Voice over IP Networks". *ACM Computing Research Repository*, 2008

78 **Zahid Anwar**, William Yurcik, Vivek Pandey, Asim Shankar, Indranil Gupta, and Roy H Campbell. "Leveraging Social-Network Infrastructure to Improve Peer-to-Peer Overlay Performance: Results from Orkut". *arXiv preprint cs/0509095*, 2005