BRYAN PEARSON

PERSONAL INFORMATION

University: University of Central Florida
College Unit: College of Engineering and Computer Science (CECS)
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BIOGRAPHY

Bryan Pearson is a Ph.D candidate at the University of Central Florida. His advisors are Dr. Xinwen Fu and Dr. Cliff Zou. He is pursuing his degree in Computer Science, with a focus on Internet of Things (IoT) system and security. He received his B.S. in Computer Science from Stetson University (2014), with minors in Physics and Mathematics.

Bryan's research interests include security and forensics of wireless sensor networks (WSN) and IoT systems, especially software and hardware security. He also has interests in networking quality of service (QoS), data mining, and web design. He has been publishing in several conferences and journals including ICC, ICPADS, IFIP, INFOCOM, ICNC, and MDPI Sensors.

EDUCATION

University of Central Florida *August 2018 - Present*
Ph.D in Computer Science
Focus: Internet of Things (IoT) security
Advisors: Dr. Cliff Zou & Dr. Xinwen Fu

Stetson University *May 2018*
B.S. in Computer Science *GPA: 3.507 / 4.000*
Minors in Math and Physics
Advisor: Dr. Daniel Plante

RESEARCH INTERESTS

- IoT security and forensics
- Applications and solutions of WSN and IoT
- Networking and computer systems QoS
- Light cryptography implementation and optimizations

WORK EXPERIENCE

Graduate Assistant *August 2018 - Present*
Florida IT Pathways to Success (Flit-Path)

Graduate Research Assistant *August 2018 - August 2019*
University of Central Florida, Department of Computer Science

Instructor *June 2017 - July 2018*
ID Tech Camps

Clerical Assistant *May 2017 - June 2018*
Stetson University, Departments of English/Computer Science

SCHOLARSHIPS AND GRANTS

University of Central Florida

Graduate Presentation Fellowship	*Spring 2020*
IEEE ICC NSF Student Travel Grant	*April 2019*
Graduate Presentation Fellowship	*February 2019*
Graduate ORC Doctoral Fellowship	*August 2018*
Flit-Path NSF Grant	*August 2018*

Stetson University

Presidential Scholarship	*August 2014 - May 2018*
Federal Pell Grant	*August 2014 - May 2018*
Bright Futures FASA	*August 2014 - May 2018*

ACADEMIC ACTIVITIES

Committee Membership

1. Program Committee, *Consortium for Computing Sciences in Colleges (CCSC SE)* *2020*
2. Web Chair (Organizing Committee), *SecureComm* *2019*

Refereed Journal Papers

1. *IEEE Internet of Things Journal (IoT-J)* *2021*
2. *IEEE Internet of Things Journal (IoT-J)* *2020*
3. *IEEE Internet of Things Journal (IoT-J)* *2019*

Refereed Conference Papers

1. *IEEE International Conference on Distributed Computing Systems (ICDCS)* *2021*
2. *IEEE International Conference on Parallel and Distributed Systems (ICPADS)* *2020*
3. *Consortium for Computing Sciences in Colleges (CCSC SE)* *2020*

NOTABLE PROJECTS

MosquittoByte: Fuzzing MQTT Message Brokers

- This project tries to find vulnerabilities in MQTT brokers using a mutation-based fuzzer. The fuzzer starts with a corpus of valid MQTT packets and applies various fuzzing strategies until the broker crashes.
- To increase code coverage, the fuzzer monitors network output and stdout/stderr and adds packets to the input corpus which trigger new behavior.
- Written in Python 3.
- Discovered 5 major vulnerabilities in 4 open-source MQTT brokers.
- Source code: `https://github.com/PBearson/MosquittoByte`
- The report for this project will be released after all affected parties have released patches.

SIC^2: Securing MCU Based IoT Devices with Low-cost Crypto Coprocessors

- We demonstrate how the popular ESP32 platform is vulnerable to format string attacks, and how these attacks can be used to compromise private data which is used in the application
- As a general defense, we propose a framework which pairs MCU based IoT devices with the cryptographic coprocessors, which offer secure key storage and secure execution environment
- Proof-of-concept: ESP-WROOM-32 with ATECC608A
- More information: `https://bpearson.net/papers/ICPADS_2020_Camera_Ready.pdf`

STAIR: Smart Air Network

- This project plots ambient particulate matter, CO2, air pressure, temperature, and humidity data from sensors onto a map. Our current deployment of devices are built using the SAML11 microcontroller.

- My contributions to this project include integration with Amazon Web Services such as IoT Core (communication from/to sensors), Lambda (payload decoding), DynamoDB (data storage), EC2 (web server), and CodePipeline (CI/CD).
- Publication is forthcoming. The website is available here: `http://3.85.149.13/`.
- Source code available upon request.

IoT Security Hands-on Laboratory

- We develop a low-cost platform with an industrial grade MCU ESP32 equipped with a crypto co-processor ATECC608A and create teaching materials including labs and case studies for IoT security education.
- Labs include: JTAG hacking, JTAG defense, UART hacking, UART defense, flash ethical hacking, secure key storage, secure booting, network attack, network defense, and secure over-the-air update.
- More information: `https://link.springer.com/chapter/10.1007/978-3-030-43605-6_17`
- Sample lab: `http://cyberforensic.net/labs/iot_secure_key_storage/secure_key_storage.html`

PUBLICATIONS

1. M. Cash, S. Wang, B. Pearson, Q. Zhou, X. Fu. On Automating BACnet Device Discovery and Property Identification. *In proceedings of IEEE International Conference on Communications (ICC),* Montreal. June 2021.
2. Z. Ling, R. Liu, Y. Zhang, K. Jia, B. Pearson, X. Fu, L. Junzhou. Prison Break of Android Reflection Restriction and Defense. *In proceedings of IEEE International Conference on Computer Communications (INFOCOM) 2021.* Virtual conference. May 2021.
3. B. Pearson, C. Zou, Y. Zhang, Z. Ling, X. Fu. SIC^2: Securing Microcontroller Based IoT Devices with Low-cost Crypto Coprocessors. *In proceedings of IEEE International Conference on Parallel and Distributed Systems (ICPADS) 2020.* Hong Kong. Dec. 2020.
4. B. Pearson, D. Plante. Secure Deployment of Containerized IoT Systems. *In proceedings of IEEE SouthEastCon 2020.* Raleigh, North Carolina. Mar. 2020.
5. Y. Zhang, J. Weng, Z. Ling, B. Pearson, X. Fu. BLESS: A BLE Application Security Scanning Framework. *In proceedings of IEEE INFOCOM 2020 - IEEE Conference on Computer Communications (INFOCOM).* Beijing, China. Apr. 2020.
6. B. Pearson, L. Luo, C. Zou, J. Brian, Y. Jin, X. Fu. Building a Low-cost and State-of-the-art IoT Security Hands-on Laboratory. *2nd IFIP Internation Internet of Things (IoT) Conference.* Oct. 31-Nov. 1, 2019. (Invited Paper.)
7. C. Gao, L. Luo, Y. Zhang, B. Pearson, X. Fu. Microcontroller Based IoT System Firmware Security: Case Studies. *In proceedings of IEEE International Conference on Industrial Internet (ICII)*, Orlando, FL, Nov. 2019. (**Best Paper Award.)**
8. B. Pearson, L. Luo, Y. Zhang, R. Dey, Z. Ling, M. Bassiouni, and X. Fu. On Misconception of Hardware and Cost in IoT Security and Privacy. *In proceedings of IEEE International Conference on Communications (ICC),* Shanghai, China, May 2019.
9. L. Luo, Y. Zhang, B. Pearson, Z. Ling, H. Yu, and X. Fu. On the Security and Data Integrity of Low-Cost Sensor Networks for Air Quality Monitoring. *Sensors (Basel).* Dec. 2018.
10. N. Domingo, B. Pearson, and Y. Jin. Exploitations of Wireless Interfaces Via Network Scanning. *In proceedings of IEEE International Conference on Computing, Networking and Communications (ICNC),* Santa Clara, CA, 2017.

TECHNICAL SKILLS

Languages: C, Python, Java, R, PHP, JavaScript, MatLab
Software: Arduino IDE, ESP-IDF, MatLab, Splunk, Wireshark, Mongoose OS, AWS, Google Cloud, Microsot Azure, Node.js, Apache, Nginx, Spark, Docker, Kubernetes

REFERENCES

Dr. Xinwen Fu (Primary Advisor)
Associate Professor of Computer Science *University of Central Florida*
Email: xinwenfu@ucf.edu

Dr. Cliff Zou (Co-advisor)
Associate Professor of Computer Science *University of Central Florida*
Email: changchun.zou@ucf.edu