Abdulrahman Alfares

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Education

Carnegie Mellon University - Pittsburgh, PA, USA *Jan 2023 - Dec 2024*
Master of Science in Electrical and Computer Engineering - Advanced Study, Concentration in Computer Security GPA: 3.86
Relevant Coursework: Browser Security, Differential Privacy, Information Security, Offensive Security, Secure Software Systems, Web Application Development

The Pennsylvania State University - University Park, PA, USA *Aug 2018 - Dec 2021*
Bachelor of Science in Computer Engineering, Minor in Mathematics GPA: 3.79, EECS GPA: 3.89
Relevant Coursework: Algorithms and Data Structures, Communication Networks, Operating Systems, Primality Testing, Systems Programming

Projects

CVE Reproduction - C/C++, Docker, GDB, Valgrind *Nov 2024 - Dec 2024*
- Led a team of five in investigating the following CVEs: 2023-40889, 2023-40890, 2022-38143.
- Worked through relevant source code to develop a working proof of concept (PoC) for each CVE mentioned above and present our findings.
- Addressed attack limitations for CVE-2023-40889 & CVE-2023-40890 by determining how many bytes could be read or written out of bounds.

Marketplace Web Application - Python, Django, Stripe, AWS, Daphne, nginx, PostgreSQL *Oct 2024 - Dec 2024*
- Created, in a team of three, a web app aimed at providing a centralized platform for Carnegie Mellon students to buy and sell personal items.
- Managed payments made through the web application by integrating Stripe Connect and creating our own balance system.
- Implemented robust database transaction handling by enforcing ACID properties for data consistency during concurrent payment operations.

Build it, Break it, Fix it - C, libsodium, OpenSSL *Jan 2024 - Mar 2024*
- Implemented, in a team of two, a secure log to describe the state of an art gallery; the guests and employees who enter and leave all rooms.
- Attacked other teams' "secure" implementations to break confidentiality and integrity of their logs' reads and writes.
- Patched all known confidentiality and integrity leaks of our program after receiving a report of successful attacks on our implementation.

SecWasm - WebAssembly, OCaml *Nov 2023 - Dec 2023*
- Built upon, in a team of two, SecMiniWasm, an existing OCaml implementation of SecWasm (Information-Flow Control system for Wasm).
- Extended the abstract syntax and typing rules of SecMiniWasm to support i64 value types and if-then-else instructions.
- Implemented runtime performance analysis of dynamic checks performed by SecMiniWasm for an interleaved memory layout.

Sensitivity Analysis of Spectre-PHT - C, Python, gem5 *Feb 2023 - Apr 2023*
- Reviewed, in a team of two, literature for speculative execution attacks and properly reproducing Spectre-PHT.
- Examined the efficacy of the exploit by analyzing how it interacts with varying cache parameters.
- Determined the attack's sensitivity to the transient execution window, cache associativity, and memory access pattern.

Cellular-based IoT using oneM2M - Python, C, AWS [Link to project] *Aug 2021 - Dec 2021*
- Developed, in a team of five, an automated irrigation system consisting of IoT devices using the oneM2M standard.
- Built a dashboard application to monitor sensors and control water valves.
- Programed multiple Nordic Thingy:91s to work either as a sensor or actuator on top of the Zephyr RTOS.

Experience

Teaching Assistant - Electrical & Computer Engineering Dept., Carnegie Mellon University *Jan 2024 - May 2024, Aug 2024 - Dec 2024*
- Assisted in teaching two graduate-level courses: Introduction to Information Security (18631) & Browser Security (18636).
- Prepared assignments, held weekly office hours, led recitation sections, graded projects and exams, and helped in future course development.

Research Intern - CyLab Security & Privacy Institute, Carnegie Mellon University *May 2023 - Aug 2024*
- Researched methodology to automate website login and registration processes under the supervision of Dr. Limin Jia.
- Created a PoC of an automated login workflow utilizing Single Sign-On (SSO) and a custom implementation of pyppeteer.
- Expanded upon existing infrastructure for a DOM-XSS project to enable analysis on web pages requiring authentication using the PoC.

Honors and Memberships

Top 3 Project Recognition - CMU WebApps Course, Dr. Jeffrey Eppinger & Dr. Austin Henley *Dec 2024*

Member - Plaid Parliament of Pwning (PPP), CMU's Hacking Team & occasionally Maple Mallard Magistrates (MMM) *Aug 2024 - Present*
- Participated in various capture the flag (CTF) competitions like Hackceler8 (Google CTF finals), BuckeyeCTF, CSAW & NSA Codebreakers.
- Focused on solving binary (pwn) and web exploitation challenges.
- Created two web CTF problems: prototype pollution in JavaScript and ORM injections.

Member - Eta Kappa Nu (HKN), IEEE's Honor Society, Sigma (CMU) Chapter *Dec 2023 - Dec 2024*

2nd Place Award - International oneM2M Hackathon, Korea Electronics Technology Institute (KETI) *Nov 2021*

Dean's List - The Pennsylvania State University *Spring 2019 - Fall 2020, Fall 2021*

Skills

Programming & Scripting Languages - Python, C, JavaScript, Shell Scripting, Rust, OCaml, Dafny, WebAssembly, x86

Tools & Services - Git, Burp Suite, mitmproxy, Docker, AWS EC2, GDB, Valgrind, pwntools, Wireshark, OpenSSL, libsodium, Postman

Languages - Arabic, English (Native/Bilingual Proficiency)