Daming Dominic Chen

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Research Interests

Systems security, program analysis, compilers, operating systems, embedded systems.

Education

Carnegie Mellon University — **Pittsburgh, PA**
Computer Science (Ph.D.) — *Aug. 2014 - June 2021*

Carnegie Mellon University — **Pittsburgh, PA**
Computer Science (M.S.) — *May 2016*

Arizona State University — **Tempe, AZ**
Computer Science (B.S.), Mathematics (B.A.) — *Aug. 2010 - May 2014*

Employment

Trusted Kernel Engineer, *Core OS*, Apple — **Cupertino, CA**
Aug. 2021 - Present

Graduate Research Assistant, Carnegie Mellon University — **Pittsburgh, PA**
C/C++, x86 assembly; Clang/LLVM, CMake, IDA Pro, Linux kernel, OPAE, FPGA, QEMU, Z3 — *Aug. 2014 - Jun. 2021*
 − Designed, built, and evaluated HerQules, a hardware-accelerated framework for enforcing integrity-based security policies.
 − Designed, built, and evaluated TardisTM, a software transactional memory system that supports incremental repair.
 − Contributed Z3-based constraint solver backend and floating-point symbolic execution support to Clang Static Analyzer.
 − Designed, built, and evaluated FIRMADYNE, a system for large-scale emulation and analysis of Linux-based firmware.

Software Engineering Intern, *Chrome*, Google — **Mountain View, CA**
C++, WebAssembly; AFL, binaryen, Clang/LLVM, V8 — *May 2016 - Aug. 2016*
 − Wrote security design document for WebAssembly, and implemented control-flow integrity in the compiler toolchain.
 − Performed automated fuzz testing, and fixed correctness/security bugs in the compiler toolchain and JavaScript engine.

Software Engineering Intern, *ChromeOS Firmware*, Google — **Mountain View, CA**
ARM assembly, C; JTAG, SPI, STM32, USB 3.1, USB Mass Storage — *May 2014 - Aug. 2014*
 − Developed closed-case debug functionality for Chromebook Pixel (2015) over USB Type-C connector.
 − Implemented protocols for SPI flash, USB mass storage, and JTAG peripherals on STM32.

Undergraduate Research Assistant, *SEFCOM*, Arizona State University — **Tempe, AZ**
C, Python — *Aug. 2012 - May 2014*
 − Developed undergraduate honors thesis analyzing the security of processor microcode.

ASU/NASA Space Grant Research Intern, *EERIL*, Arizona State University — **Tempe, AZ**
Year-Round Research Intern, NASA Jet Propulsion Laboratory — **Pasadena, CA**
C++, C#, Python; ArduPilot, EAGLE, Iridium — *Aug. 2011 / Dec. 2013 - May 2014*
 − Developed proposal and technical platform for ICESat-2 EPO Mission Hexacopter Engineering Challenge.
 − Designed control software and embedded hardware for Antarctic Micro Subglacial Lake Exploration Device.

UROP Research Placement, *Security Research Group*, Imperial College London — **London, UK**
C++, Python; Buildbot, LLVM, Klee — *May 2013 - Aug. 2013*
 − Created teaching module for modeling and verification of network security protocols using AVISPA.
 − Helped port Klee symbolic verification tool and set up continuous integration system.

Summer Technical Intern, *Center for Cyber Defenders*, Sandia National Laboratories — **Albuquerque, NM**
C, Java, Python; Buildroot, GDB, Linux kernel — *May 2012 - Aug. 2012*
 − Implemented debug framework for Android platform on ARM capable of kernel and system-level analysis.
 − Developed and pentested secure Linux-based voting machine platform for pilot secure design competition.

Undergraduate Research Assistant, *Operating Systems Laboratory*, Arizona State University — **Tempe, AZ**
nesC; TinyOS — *Aug. 2010 - May 2012*
 − Helped design peer-to-peer message-passing framework for wireless sensor network.

Publications

<u>Daming D. Chen</u>, Wen Shih Lim, Mohammad Bakhshalipour, Phillip B. Gibbons, James C. Hoe, Bryan Parno. **HerQules: Securing Programs via Hardware-Enforced Message Queues**. *Architectural Support for Programming Languages and Operating Systems (ASPLOS)*. Detroit, MI. April 2021.

<u>Daming D. Chen</u>, Phillip B. Gibbons, and Todd C. Mowry. **TardisTM: Incremental Repair for Transactional Memory**. *Workshop on Programming Models and Applications for Multicores and Manycores (PMAM)*. San Diego, CA. February 2020.

<u>Daming D. Chen</u>, Manuel Egele, Maverick Woo, and David Brumley. **Towards Automated Dynamic Analysis for Linux-based Embedded Firmware**. *Network and Distributed System Security Symposium (NDSS)*. San Diego, CA. February 2016.

Alberto E. Behar, <u>Daming D. Chen</u>, Colin Ho, Emily McBryan, Christian Walter, Joseph Horen, Scott Foster, Tyler Foster, Andrew Warren, <u>Sai H. Vemprala</u>, James M. Crowell. **The Micro Subglacial Lake Exploration Device**. *Underwater Technology 33.1*, July 2015.

Yevgeniy Vorobeychik, Michael Z. Lee, Adam Anderson, Robert M. Adair, William D. Atkins, Alan Berryhill, <u>Daming D. Chen</u>, Ben Cook, Jeremy Erickson, Steve Hurd, Ron Olsberg, Lyndon Pierson, Owen Redwood. **FIREAXE: The DHS Secure Design Competition Pilot**. *Cyber Security and Information Intelligence Research Workshop (CSIIRW)*. Oak Ridge, TN. January 2013.

Posters

Daming D. Chen, Michael Huth. **Developing teaching material for formal modeling of security protocols**. 6th International Conference on Trust & Trustworthy Computing (TRUST). London, UK. June 2013.

William D. Atkins, Yevgeniy Vorobeychik, Adam Anderson, **Daming D. Chen**, Michael Z. Lee, Robert M. Adair, Alan Berryhill, Owen Redwood. **FIREAXE: The DHS Secure Design Competition Pilot**. 28th Annual Computer Security Applications Conference (ACSAC). Orlando, FL. December 2012.

Meddage S. Fernando, Pushkar M. Mulay, Michael A. Cartwright, **Daming D. Chen**, Amiya Bhattacharya, Partha Dasgupta. **Demo: Spanning an Underlay over a Host WPAN Cluster**. 9th ACM/USENIX International Conference on Mobile Systems, Applications, and Services (MobiSys). Washington, DC. May 2011.

Teaching

15-745: Optimizing Compilers for Modern Architectures | Spring 2016
Teaching Assistant, Carnegie Mellon University

18-487: Introduction to Computer and Network Security and Applied Cryptography | Fall 2015
Teaching Assistant, Carnegie Mellon University

Service

PhD Admissions Committee | 2016
Computer Science Department, Carnegie Mellon University

Student Program Committee | 2016
Symposium on Security & Privacy, IEEE

Awards

National Defense Science & Engineering Fellowship | Apr. 2015
National Physical Science Consortium Fellowship (declined) | Apr. 2014
Flinn Scholarship, Robert C. Byrd Scholarship, National Merit Scholarship, National AP Scholar | May 2010

Skills

Programming Languages: Asm, C, C++, LaTeX, Python   **Operating Systems**: Linux, Windows
Architectures: ARM, x86-64, STM32, WebAssembly   **Software**: Clang/LLVM, EAGLE, Git, SolidWorks
Vulnerabilities Discovered: Dropbox, United Airlines, Intel, Netgear, D-Link
Languages: English (Fluent), Chinese (Proficient), Spanish (Conversational)
Amateur Radio: KG7NSS (General)

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