Daniel Bittman

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Education

University of California, Santa Cruz July 2016 - Present
Ph.D., Department of Computer Science
Adviser: Ethan Miller
Current - Ph.D. Student

University of California, Santa Cruz September 2011 - June 2016

- *Bachelor of Science, Computer Science*. Participated in research, resulting in publication and thesis. Thesis: Designing a Wait-free MPSC Queue For Use in SeaOS.
- *Bachelor of Science, Physics*. Thesis: Solving Boundary Value Problems Efficiently Using Computers.

Research Experience

Storage Systems Research Center, UC Santa Cruz July 2016 - Present
Graduate Student Researcher. PI: Ethan Miller

- Twizzler: Designed and implemented an operating system designed for byte-addressable non-volatile memory, including kernel and user-level system design and implementation.
- Sub-process Fault Isolation: Designed and implemented a shared library for Linux that provides isolation and separation between libraries within a process, with total transparency to the application and an unmodified kernel. The purpose of this project was to explore the problems with this approach in order to determine the minimum support required for such isolation and security guarantees.

Disorderly Labs, UC Santa Cruz January 2017 - Present
Graduate Student Researcher. PI: Peter Alvaro

- System-level Provenance Collection: Designed a system which used systemcall interposition to capture provenance information within an application in a distributed system.

Storage Systems Research Center, UCSC January 2013 - June 2016
Undergraduate Student Researcher. PI: Darrell Long. Work under DJ Capelis.

- SeaOS: Designed and developed an operating system intended for future use in research projects. The primary designed goals were simplicity and understandability, thus facilitating proof-of-concept implementations of research ideas.

Working-group on Applied Security and Privacy, UCSC January 2013 - June 2016
Undergraduate Student Researcher. PI: Darrell Long. Work under DJ Capelis.

- VM monitor breakout: Implemented and tested an exploit for a virtual machine security monitor which used Intel's VT-x and trusted CR3 features to perform introspection on an untrusted machine. We showed that their design allowed a compromised kernel to craft a delayed interrupt which allowed jumping to an arbitrary location in the security monitor's code.

Publications

"Twizzler: a Data-Centric OS for Non-volatile Memory". **Daniel Bittman**, Peter Alvaro, Pankaj Mehra, Darrell D. E. Long, Ethan L. Miller. 2020 USENIX Annual Technical Conference (USENIX ATC 2020). July, 2020.

"A Persistent Problem: Managing Pointers in NVM". **Daniel Bittman**, Peter Alvaro, Ethan L. Miller. Proceedings of the 10th Workshop on Programming Languages and Operating Systems (PLOS '19). Oct, 2019.

"Co-evolving Tracing and Fault Injection with Box of Pain". **Daniel Bittman**, Ethan L. Miller, Peter Alvaro. Proceedings of the 9th USENIX Workshop on Hot Topics in Cloud Computing (HotCloud 2017). July, 2019.

"A Tale of Two Abstractions: The Case for Object Space". **Daniel Bittman**, Peter Alvaro, Darrell D. E. Long, Ethan L. Miller. Proceedings of HotStorage 2019. July, 2019.

"The Flipside: A Bit Flip Saved is Power and Lifetime Earned". **Daniel Bittman**, Peter Alvaro, Darrell D. E. Long, Ethan L. Miller. ;login: the USENIX magazine, April, 2019.

"Optimizing Systems for Byte-Addressable NVM by Reducing Bit Flipping." **Daniel Bittman**, Darrell D. E. Long, Peter Alvaro, and Ethan L. Miller. In proceedings of the 17th USENIX Conference on File and Storage Technologies (FAST '19). Boston, MA. February 2019.

“Efficient Reconstruction Techniques for Disaster Recovery in Secret-Split Datastores.” Sinjoni Mukhopadhyay, Joel Frank, **Daniel Bittman**, Darrell Long and Ethan Miller. 26th IEEE MASCOTS 18. Milwaukee, Wisconsin. September 2018.

“Designing Data Structures to Minimize Bit Flips on NVM.” **Daniel Bittman**, Matthew Gray, Justin Raizes, Sinjoni Mukhopadhyay, Matt Bryson, Peter Alvaro, Darrell D. E. Long, Ethan L. Miller. The 7th IEEE Non-Volatile Memory Systems and Applications Symposium (NVMSA 18). Hakodate, Japan. August 2018.

“Reducing NVM Writes with Optimized Shadow Paging.” Yuanjiang Ni, Jishen Zhao, **Daniel Bittman**, Ethan L. Miller. Proceedings of HotStorage 2018, July 2018.

“Inkpack: A Secure, Data-Exposure Resistant Storage System.” Oceane Bel, Kenneth Chang, **Daniel Bittman**, Hiroshi Isozaki, Darrell D. E. Long, Ethan L. Miller. Proceedings of the 11th ACM International Systems and Storage Conference (SYSTOR 2018). June 2018.

“Twizzler: An Operating System for Next-Generation Memory Hierarchies.” **Daniel Bittman**, Matthew Bryson, Yuanjiang Ni, Arjun Govindjee, Isaak Cherdak, Pankaj Mehra, Darrell D. E. Long, Ethan L. Miller. University of California, Santa Cruz. Technical Report UCSC-SSRC-17-01. December 2017.

“Twizzler: The Design and Implementation of a NVM Aware OS.” Matt Bryson, **Daniel Bittman**, Darrell Long, Ethan Miller. 2017 Non-volatile Memories Workshop, UCSD. March 13th, 2017.

“The Hypervisor Exploit I Sat on for Five Years.” DJ Capelis, **Daniel Bittman**. International Journal of PoC||GTFO. June 20th, 2015.

Invited Talks

“Data-centric OSes: NVM and the Death of the Process”. **Daniel Bittman**, Peter Alvaro, Ethan L. Miller. High Performance Transaction Systems 2019. Nov, 2019.

“A Sharing Problem we all Share: Data-Centric OSes, Persistent Memory, and OS Evolution”. **Daniel Bittman**, Peter Alvaro, Ethan L. Miller. IBM Research Student Workshop on Systems and Cloud

“Twizzler: The Design and Implementation of a Non-volatile memory aware OS”. Matt Bryson, **Daniel Bittman**, Ethan Miller, Darrell Long. 8th Non-volatile Memories Workshop. UC San Diego. March 13th, 2017.

“Twizzler: The Design and Implementation of a Non-volatile memory aware OS.” Matt Bryson, **Daniel Bittman**, Ethan Miller, Darrell Long. 8th Non-volatile Memories Workshop. UC San Diego. March 13th, 2017.

“SeaOS: A Simple OS for Multicore Machines.” **Daniel Bittman**. Vail Computer Elements Workshop. Vail, CO. June 2017.