

BENJAMIN REIDYS

Email: breidys2@illinois.edu

Office: 230 Coordinated Science Lab, Urbana, Illinois 61801

Website: breidys2.github.io

RESEARCH INTERESTS

Memory and Storage Systems, Network/Storage Codesign, Data Center Architecture

EDUCATION

University of Illinois at Urbana-Champaign

August 2020 - Present

PhD in Computer Science

Advised by Dr. Jian Huang

Virginia Tech

August 2016 - May 2020

Dual Bachelors of Science in Computer Science and Mathematics

Overall GPA: 3.96/4.00

PUBLICATIONS

RackBlox: A Software-Defined Rack-Scale Storage System with Network-Storage Co-Design. Benjamin Reidys, Yuqi Xue, Yiqi Liu, Daixuan Li, Bharat Sukhwani, Wen-mei Hwu, Deming Chen, Sameh Asaad, Jian Huang. To appear in *The 29th ACM Symposium on Operating Systems Principles (SOSP '23)*.

BlockFlex: Enabling Storage Harvesting with Software-Defined Flash in Modern Cloud Platforms. Benjamin Reidys*, Jinghan Sun*, Anirudh Badam, Shadi Noghbi, Jian Huang. In *16th USENIX Symposium on Operating Systems Design and Implementation (OSDI'22)*. *Co-primary authors.

RSSD: Defend against Ransomware with Hardware-Isolated Network-Storage Codesign and Post-Attack Analysis. Benjamin Reidys, Peng Liu, Jian Huang. In *Proceedings of the The 27th International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS '22)*.

Distributed Data Persistency. Apostolos Kokolis, Antonis Psistakis, Benjamin Reidys, Jian Huang, Josep Torrellas. In *Proceedings of the 54th IEEE/ACM International Symposium on Microarchitecture (MICRO '21)*.

Uniheap: Managing Persistent Objects Across Managed Runtimes for Non-Volatile Memory. Daixuan Li, Benjamin Reidys, Jinghan Sun, Thomas Shull, Josep Torrellas, Jian Huang. In *Proceedings of the 14th ACM International System and Storage Conference (SYSTOR '21)*.

IMPACT OF MY RESEARCH

Rack-Scale Storage with Network/Storage Codesign

- RackBlox proposes a new software-defined rack-scale storage design with network/storage codesign. RackBlox unifies the control planes of software-defined networking and software-defined storage to enable rack-scale wear leveling and mitigate the impact of GC. Similarly, RackBlox facilitates state sharing for I/O events in the data plane, achieving predictable end-to-end performance. This work was also selected for presentation at HotInfra 2023.

Learning-Based Storage Harvesting in Cloud

- BlockFlex addresses the low storage utilization problem in modern cloud platforms. To solve this issue, BlockFlex uses lightweight machine learning techniques to learn workload patterns and harvest storage resources according to workload needs. To facilitate storage harvesting, BlockFlex rethinks current storage abstraction with software-defined flash architecture. Our results show a 25% improvement in storage utilization on average. We collaborated with Microsoft for this work, which is accepted to OSDI and is already attracting interest from industry.

Hardware-Assisted Logging to Defend Against New Ransomware Attacks

- To defend against ransomware, RSSD develops a hardware-isolated network/storage codesign approach to securely store user data remotely to recover all user data when attacked. RSSD also securely logs all storage operations to facilitate trusted post-attack analysis and learn ransomware trends quickly. By recovering all user data and by adapting to ransomware trends, RSSD presents the first fundamental solution against evolving ransomware. This work was also selected for presentation at NVMW 2022.

Distributed Data Persistency

- The introduction of non-volatile memory makes memory persistency a critical and understudied consideration in modern distributed systems. Distributed Data Persistency is the first work to investigate the combinations of these memory persistency models and data consistency models. We analyze the impact on performance, programmability, and intuitiveness of each combination. This work was selected as one of the IEEE Micro Top Picks of 2022 and attracted attention from industry, including Google.

Managing Persistent Objects Across Managed Runtimes for NVM

- Uniheap develops managed runtimes as a new filesystem by enabling object sharing across managed runtimes. It improves performance by over 21%, ensures crash safety, and coordinates garbage collection across managed runtimes. This work was also selected for presentation at NVMW 2022.

HONORS AND AWARDS

- ISCA 2023 Student Travel Grant
- NVMW 2023 Student Travel Grant
- NVMW 2023 Memorable Paper Award Finalist
- Usenix Student Grant Program (for OSDI 2022)
- NSF GRFP Honorable Mention (2022)
- ASPLOS 2022 Travel Grant
- IEEE Micro Top Pick 2022
- Phi Beta Kappa Membership (Spring 2018)
- Robert Earl Spencer and Dr. Herbert Earl Spencer Scholarship (2018-19)
- CS Junior Scholar Award (Spring 2019)
- CS Sophomore Scholar Award (Spring 2018)
- Dean's List with Distinction (Every semester except Spring 2019)
- Computer Science Research Consortium Scholarship (2017-18)
- Investment in Excellence Scholarship (2018-18)
- Pratt Engineering Scholarship (Spring 2017)

WORK EXPERIENCE

Systems Platform Research Lab
Graduate Research Assistant

May 2020 - Present
Urbana, IL

Virginia Tech CS 3214: Introduction to Operating Systems
Undergraduate Teaching Assistant

August 2019 - May 2020
Blacksburg, VA

- Hosted office hours answering student questions and helping students with debugging project code.

Network Dynamical Systems and Simulation Science Laboratory August 2016 - May 2018
Undergraduate Research Assistant Blacksburg, VA

- Developed an architecture for scraping periscope streams from Twitter as data collection.

Los Alamos National Laboratory CCS-3 Group Summers 2015-17 and 2020
Intern Los Alamos, NM

- Benchmarked the Simian and ROSS parallel discrete event simulators.
- Implemented HPC benchmarks for the Performance Prediction Toolkit.

PROFESSIONAL SERVICE

- **Artifact Evaluation Committee**
 - MICRO 2023, EuroSys 2023, ASPLOS 2023, OSDI 2023, ATC 2023

PROGRAMMING ACTIVITIES

- **International Collegiate Programming Contest (ICPC) (2018-20)**
 - 56th of 117 teams at the 2021 ICPC World Finals
 - 21st of 59 teams at the 2020 North American Championship
 - 5th of 160 teams at the 2019 MidAtlantic Regional Contest
 - 30th of 183 teams at the 2018 MidAtlantic Regional Contest