

# Sekwon Lee

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## Research Interest

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**Computer systems:** Storage/file systems, Distributed systems, Operating systems, Database systems

**Focus:** Next-generation systems for emerging memory (PM) and disaggregation (RDMA, CXL) technologies

- Designing elastic, high-performance, scalable, crash-recoverable key-value stores
- Designing concurrent, crash-consistent index structures for storage systems
- Improving the performance and reliability of file systems

## Education

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### University of Texas at Austin

PH.D. IN COMPUTER SCIENCE

- Advisor: Vijay Chidambaram

Austin, TX, US

Aug. 2018 - Dec. 2023

### UNIST (Ulsan National Institute of Science and Technology)

M.S. IN COMPUTER SCIENCE AND ENGINEERING

- Advisor: Sam H. Noh

Ulsan, South Korea

Mar. 2016 - Feb. 2018

### Hongik University

B.S. IN COMPUTER ENGINEERING

- Undergraduate advisor: Sam H. Noh

Seoul, South Korea

Mar. 2009 - Feb. 2015

## Work Experience

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### Hewlett Packard Labs

RESEARCH ENGINEER

- Job description: Work as a member of team of other research engineers carrying out the investigation, design, and implementation of libraries and systems for far memory, which is a disaggregated memory pool shared across heterogeneous and decentralized compute nodes over high performance interconnects (e.g., HPE Slingshot, CXL, Infini-band).
- Supervisor: Sharad Singhal

Austin, TX, US (Remote)

Jan. 2024 - present

### Microsoft Research

RESEARCH INTERN

- Job description: Scale-out AMBROSIA, a general framework to build resilient distributed systems. Implemented sharding supports with functions to filter out RPC requests and log entries irrelevant to the corresponding shard membership.
- Mentor: Jonathan Goldstein

Austin, TX, US (Remote)

May 2021 - Aug. 2021

### Hewlett Packard Labs

RESEARCH ASSOCIATE INTERN

- Job description: Designing far-memory data structures optimized for one-sided RDMA operations. Designed and implemented a hybrid index structure combining a prefix trie with hash tables to take both advantages of an easily cacheable trie structure and one-sided RDMA-efficient hash tables.
- Mentors: Kimberly Keeton, Sharad Singhal, and Marcos K. Aguilera

Palo Alto, CA, US

June 2019 - Aug. 2019

## UNIST (Ulsan National Institute of Science and Technology)

Ulsan, South Korea

RESEARCHER

Mar. 2018 - July 2018

- Job description: Designing the compiler-directed failure-atomic system for PM. Applied FASE (Failure-Atomic SEctions) frameworks to various applications like Memcached and evaluated their performance. This work was published in MICRO'18.
- Supervisor: Sam H. Noh

## Hewlett Packard Labs

Palo Alto, CA, US

RESEARCH ASSOCIATE INTERN

June 2017 - Sep. 2017

- Job description: Designing a DRAM cache for key-value stores working on FAM (Fabric-Attached Memory). Designed and implemented a hybrid approach that caches both value and shortcut entries. The posters of this work were presented at OSDI'18 and SOCC'18.
- Mentors: Kimberly Keeton, Haris Volos, and Yupu Zhang

## UNIST (Ulsan National Institute of Science and Technology)

Ulsan, South Korea

RESEARCHER

Oct. 2015 - Feb. 2016

- Job description: Analyzing performance implications of index structures in PM-based file systems. Evaluated the performance of PMFS while changing its inode and block mapping structures with diverse index structures. This work was published in KCC'16.
- Supervisor: Sam H. Noh

## ROK DCC, Republic of Korea Armed Forces

Gwacheon, South Korea

SIGNALLER

Aug. 2010 - May 2012

## Publication

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### Conferences

- [1] **Sekwon Lee**, Soujanya Ponnappalli, Sharad Singhal, Marcos K. Aguilera, Kimberly Keeton, and Vijay Chidambaram, **DINOMO: An Elastic, Scalable, High-Performance Key-Value Store for Disaggregated Persistent Memory**, Proceedings of the VLDB Endowment, Volume 15, Issue 13 (VLDB 2023).
- [2] **Se Kwon Lee**, Jayashree Mohan, Sanidhya Kashyap, Taesoo Kim, and Vijay Chidambaram, **RECIPE: Converting Concurrent DRAM Indexes to Persistent-Memory Indexes**, Proceedings of the 27th ACM Symposium on Operating Systems Principles (SOSP 2019).
- [3] Rohan Kadekodi, **Se Kwon Lee**, Sanidhya Kashyap, Taesoo Kim, Aasheesh Kolli and Vijay Chidambaram, **SplitFS: Reducing Software Overhead in File Systems for Persistent Memory**, Proceedings of the 27th ACM Symposium on Operating Systems Principles (SOSP 2019).
- [4] Qingrui Liu, Joseph Izraelevitz, **Se Kwon Lee**, Michael L. Scott, Sam H. Noh, and Changhee Jung, **iDO: Compiler-Directed Failure Atomicity for Nonvolatile Memory**, Proceedings of the 51st Annual IEEE/ACM International Symposium on Microarchitecture (MICRO 2018).
- [5] **Se Kwon Lee**, K. Hyun Lim, Hyunsub Song, Beomseok Nam, and Sam H. Noh, **WORD: Write Optimal Radix Tree for Persistent Memory Storage Systems**, Proceedings of the 15th USENIX Conference on File and Storage Technology (FAST 2017).
- [6] Hyunsub Song, Young Je Moon, **Se Kwon Lee** and Sam H. Noh, **PMAL: Enabling Lightweight Adaptation of Legacy File Systems on Persistent Memory Systems**, Proceedings of the 2017 IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS 2017).
- [7] **Se Kwon Lee**, Hyunsub Song, Young Je Moon and Sam H. Noh, **Experimental Evaluation of File System Data Structures for New Memory based Storage**, Proceedings of the 2016 Korea Computer Congress (KCC 2016, **Best Paper Award**).

- [8] Hyunsub Song, Young Je Moon, **Se Kwon Lee** and Sam H. Noh, **Lightweight Adaptation of Legacy File Systems for Persistent Memory based Storage**, Proceedings of the 2016 Korea Computer Congress (KCC 2016, **Best Paper Award**).

## Workshops

- [1] **Sekwon Lee**, Soujanya Ponnappalli, Sharad Singhal, Marcos K. Aguilera, Kimberly Keeton, and Vijay Chidambaram, **DINOMO: An Elastic, Scalable, High-Performance Key-Value Store for Disaggregated Persistent Memory** (Extended abstract of the VLDB 2023 paper), The 3rd Workshop On Resource Disaggregation and Serverless Computing (WORDS 2022).
- [2] **Se Kwon Lee**, Jayashree Mohan, Sanidhya Kashyap, Taesoo Kim, and Vijay Chidambaram, **RECIPE: Converting Concurrent DRAM Indexes to Persistent-Memory Indexes** (Extended abstract of the SOSP 2019 paper), The 11th Annual Non-Volatile Memories Workshop (NVMW 2020).
- [3] Rohan Kadekodi, **Se Kwon Lee**, Sanidhya Kashyap, Taesoo Kim, Aasheesh Kolli and Vijay Chidambaram, **SplitFS: Reducing Software Overhead in File Systems for Persistent Memory** (Extended abstract of the SOSP 2019 paper), The 11th Annual Non-Volatile Memories Workshop (NVMW 2020, **Memorable Paper Award**).
- [4] Qingrui Liu, Joseph Izraelevitz, **Se Kwon Lee**, Michael L. Scott, Sam H. Noh, and Changhee Jung, **iDO: Compiler-Directed Failure Atomicity for Nonvolatile Memory** (Extended abstract of the MICRO 2018 paper), The 10th Annual Non-Volatile Memories Workshop (NVMW 2019).
- [5] **Se Kwon Lee**, K. Hyun Lim, Hyunsub Song, Beomseok Nam, and Sam H. Noh, **WORT: Write Optimal Radix Tree for Persistent Memory Storage Systems** (Extended abstract of the FAST 2017 paper), The 8th Annual Non-Volatile Memories Workshop (NVMW 2017).
- [6] Hyunsub Song, Young Je Moon, **Se Kwon Lee**, and Sam H. Noh, **Transforming Legacy File Systems into Persistent Memory Exploiting File Systems with MeLo@V**, The 8th Annual Non-Volatile Memories Workshop (NVMW 2017).

## Posters

- [1] Taeklim Kim, **Sekwon Lee**, Sergey Serebryakov, Harumi Kuno, Sharad Singhal, and Christopher J. Rossbach, **Improving GPU Utilization with a Zero-Copy Object Store for ML Applications**, Poster at the 30th ACM Symposium on Operating Systems Principles (SOSP 2024).
- [2] Haris Volos, Kimberly Keeton, Yupu Zhang, Milind Chabbi, **Se Kwon Lee**, Mark Lillibridge, Yuvraj Patel, and Wei Zhang, **Memory-Oriented Distributed Computing at Rack Scale**, Poster at the 9th ACM Symposium on Cloud Computing (SOCC 2018).
- [3] Rohan Kadekodi, **Se Kwon Lee**, Aasheesh Kolli, and Vijay Chidambaram, **Ledger: Increasing Performance of POSIX Applications on Persistent Memory**, Poster at the 13th USENIX Symposium on Operating Systems Design and Implementation (OSDI 2018).
- [4] Haris Volos, Kimberly Keeton, Yupu Zhang, Milind Chabbi, **Se Kwon Lee**, Mark Lillibridge, Yuvraj Patel, and Wei Zhang, **Software challenges for persistent fabric-attached memory**, Poster at the 13th USENIX Symposium on Operating Systems Design and Implementation (OSDI 2018).
- [5] Hyunsub Song, Young Je Moon, **Se Kwon Lee**, and Sam H. Noh, **Adapting Legacy File Systems to Work Efficiently for Persistent Memory based Storage**, Poster at the 14th USENIX Conference on File and Storage Technology (FAST 2016).

## Patents

- [1] Sam H. Noh, Young Je Moon, Hyunsub Song, and **Se Kwon Lee**, **Computing System and Method for Data Consistency**, Registration No. 10-1789933 (KO), Registration Date 10.18.2017.

## Honors & Awards

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2022 **UT Austin Graduate Dean's Prestigious Fellowship Supplement**  
2021 **UT Austin Graduate Dean's Prestigious Fellowship Supplement**  
2021 **Microsoft Research PhD Fellowship**

2022  
2021  
2021-2023

## Skills

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**Programming Languages** C, C++, C#, Python  
**System Programming** Linux kernel, Memcached, Tizen  
**Tools and libraries** Kubernetes, Docker, ZeroMQ, protobuf, YCSB benchmarks

## Professional Activities

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- Program Committee for SoCC (2024)
- Reviewer for IEEE Transactions on Knowledge and Data Engineering, ACM Transactions on Architecture and Code Optimization, ACM Transactions on Storage (2024)
- Reviewer for IEEE Transactions on Computers (2023)
- Invited talk at IBM Research (May. 2023). Data-Intensive Systems for Emerging Memory and Disaggregation Technologies
- Volunteered as Slack Co-Chair for SOSP 2021
- Invited talk at Intel Labs (Oct. 2020). RECIPE : Converting Concurrent DRAM Indexes to Persistent-Memory Indexes

## Reference

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### Vijay Chidambaram

Associate Professor, Department of CS  
University of Texas at Austin  
vijay@cs.utexas.edu

### Beomseok Nam

Associate Professor, Department of CS  
Sungkyunkwan University  
bnam@skku.edu

### Kimberly Keeton

Principal Engineer  
Google  
kimberly.keeton@gmail.com

### Marcos K. Aguilera

Principal Researcher  
VMware Research Group  
maguilera@vmware.com

### Sam H. Noh

Professor, Department of CS  
Virginia Tech  
samhnoh@vt.edu

### Changhee Jung

Associate Professor, Department of CS  
Purdue University  
chjung@purdue.edu

### Sharad Singhal

Senior Distinguished Technologist  
Hewlett Packard Enterprise  
sharad.singhal@hpe.com