Junsu Im

PhD student · DGIST

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Research Interests

My research interest is optimizing storage systems especially data indexing. I have implemented various flash translate layer (FTL) algorithms that are related to indexing logical address to physical address in NAND flash storage. Also, I am studying one of the most popular algorithms for key-value stores log-structured merge tree (LSM-tree), and I suggested several techniques of LSM-tree when LSM-tree is used for a resource-limited environment like an embedded system.

Education

Daegu Gyeongbuk Institute of Science and Technology (DGIST) — *Daegu, S.Korea*

PhD student in Department of Electrical Engineering and Computer Science (EECS) — *Mar. 2018 - Present*

- Advisor: Sungjin Lee
- GPA 3.78/4.3
- Expected graduation date - Feb. 2025

Inha University — *Incheon, S.Korea*

B.S. in Computer Science and Engineering — *Mar. 2012 - Feb. 2018*

- GPA 3.75/4.5

Research Experiences

Storage Architecture Team, Memory System Research, SK Hynix — *Seongnam, S. Korea*

Research Intern — *Oct. 2022 - Feb. 2023*

- Designing HTAP friendly LSM-tree based key-value store

CSAIL, EECS, Massachusetts Institute of Technology — *Massachusetts, U.S.A*

Research Intern — *Jul. 2019 - Aug. 2019*

- Designing LSM-tree-based key-value store engine for key-value SSD
- Integrating HW accelerator into LSM-tree-based key-value store for optimizing of its write performance

DataLab, EECS, DGIST — *Daegu, S. Korea*

Researcher — *Feb. 2018 - Present*

- Designing and implementing LSM-tree based FTL algorithms and approximate indexing for ultra-large scale SSD
- Implementing various FTL algorithms including DFTL, Page-level FTL, S-FTL and TP-FTL
- Designing and implementing transaction enabled key-value SSD for key-value based file system
- Designing and implementing LSM-tree based key-value SSD on an embedded board
- Designing and implementing cache partitioning methods for short tail latency of demand-based FTL
- Implementing LSM-tree based key-value engine for network-attached key-value storage device

Awards& Grants

Awards

Sep. 2020	**Best Student Award**, DGIST	*S. Kores*
Aug. 2020	**Kyu-Young Whang Out Standing Resaerch Award**, ICE, DGIST	*S. Kores*
Jul. 2020	**Best Paper Award**, USENIX Annual Technical Conference (ATC'20)	*U.S.A*
Dec. 2018	**Best Student Poster Award**, Daegu Technopolis Grand Innovation Festival (DGIF)	*S. Korea*
Sep. 2016	**Bronze Award in Capstone Design Fair**, Inha University	*S. Kores*
Aug. 2016	**Dean's list**, Inha University	*S. Kores*
Nov. 2015	**Grand Prize in Programming Competition**, Inha University	*S. Kores*

Grants

Jul. 2021	**Student Travel Grant**, The USENIX Association, OSDI'21	*U.S.A*
Jul. 2020	**Student Travel Grant**, The USENIX Association, ATC'20	*U.S.A*
Apr. 2019	**Student Travel Grant**, The Association for Computing Machinery (ACM), ASPLOS'19	*U.S.A*

Scholarship

Jul. 2022 **Ph.D. Scholarship Student,** SK Hynix *S. Korea*

Publications

International Publications

- **J. im**, J. Kim, S. Oh, J. Koo, J. Park, S. Lee, Solid State Drive Targeted Memory-Efficient Indexing for Universal I/O Patterns and Fragmentation Degrees, in proceedings of the ACM International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS), 2024, **(Submitted)**
- J. Koo, **J. Im**, J. Song, J. Park, E. Lee, Bryan S. Kim, S. Lee, Modernizing File System through In-Storage Indexing, in proceedings of the 15th USENIX Symposium on Operating Systems Design and Implementation (OSDI), 2021
- **J. Im**, J. Bae, C. Chung, Arivnd, and S. Lee, Design of LSM-tree-based Key-value SSDs with Bounded Tails, ACM Transactions on Stroage, vol. 19, no. 2, pp. 1–27, 2021
- **J. Im**, J. Bae, C. Chung, Arivnd, and S. Lee, PinK: High-speed In-storage Key-value Store with Bounded Tails, in proceedings of the USENIX Annual Technical Conference (ATC), 2020, **(Awarded best paper)**
- **J. Im**, H. Kim, Y. Won, J. Oh, M. Kim, and S. Lee, Probability-based Address Translation for Flash SSDs, IEEE Computer Architecture Letters, vol. 19, no. 12, pp. 97–100, 2020
- C. Chung, J. Koo, **J. Im**, Arvind, and S. Lee, LightStore: Software-defined Network-attached Key-value Drives, in proceedings of the International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS), 2019

Domestic Publications

- J. Bae, H. Kim, **J. Im**, and S. Lee, Demand-based FTL Cache Partitioning for Large Capacity SSDs, in IEMEK Journal of Embedded Systems and Applications, 2019
- H. Kim, J. Bae, **J. Im**, and S. Lee, Address Translation with Bounded Tail Latency for Large Capacity SSDs, in Journal of KIISE, 2018
- J. Koo, **J. Im**, S. Lee, High-performance Distributed Key-value Solid-state Disks, in Journal of KIISE, 2018

Patents

- S. Lee, J. Koo, **J. Im**, J. Park, Key-Value Storage Device, Host and Host-Storage System, China Patent No.202210688337.0, 2022
- S. Lee, J. Koo, **J. Im**, J. Park, Key-Value Storage Device, Host and Host-Storage System, U.S. Patent No.17-807933, 2022
- S. Lee, J. Koo, **J. Im**, J. Park, Key-Value Storage Device, Host and Host-Storage System, Korea Patent Pending No.10-2022-0034937, 2022
- S. Lee, J. Kim, **J. Im**, M. Kim, SSD DEVICE AND OPERATING METHOD OF THE SAME USING FTL BASED ON LSM-TREE AND APPROXIMATE INDEXING, Korea Patent Pending No. 10-2021-0185775
- J. Bae, S. Lee, **J. Im**, Method for demand-based FTL cache partitioning of SSDs, Korea Patent Pending No.10-2020-0020812