INHO SONG

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EDUCATION

Virginia Tech, Blacksburg, VA, USA *Aug. 2023 - present*
Ph.D. in Computer Science
Research Topic:Software/Hardware co-design
for low, predictable end-to-end latency and high throughput
Co-advised by Huaicheng Li and Sam H. Noh

Dankook University, Yongin-si, Republic of Korea *Graduated in 2023 Fall*
Master's Degree in Computer Science GPA 4.4/4.5
Research Topic: SW/HW Co-optimizing with ZNS SSD Internals and Filesystem
Master's Thesis: Design Tradeoff in ZNS SSD performance
Advisor: Jongmoo Choi

Dankook University, Yongin-si, Republic of Korea *Graduated in 2022 Spring*
Bachelor of Computer Science GPA 4.06/4.5
Department of Software

PUBLICATIONS

Inho Song, Shoaib A. Qazi, Javier González, Matias Bjørling, Sam H. Noh, and Huaicheng Li
Characterizing and Emulating FDP SSDs with Warp
24th USENIX Conference on File and Storage Technologies (FAST'26)

Hangyul Kim, **Inho Song**, and Sam H. Noh
CRAZNS: A Case for Conventional Namespace Support for RAID with ZNS SSDs [S5]
The 40th ACM/SIGAPP Symposium On Applied Computing 2025 (SAC'25)

Inho Song, Myunghoon Oh, Bryan S. Kim, Seewhan Yoo, Jae-Dong Lee, and Jongmoo Choi
ConfZNS: A Novel Emulator for Exploring Design Space of ZNS SSDs [S4]
The ACM International Systems and Storage Conference 2023 (SYSTOR'23)

JOURNAL

Inho Song, Wonjin Lee, Jae-Dong Lee, Seehwan Yoo, Jongmoo Choi
Overcoming a Zone Reclaiming Overhead with Partial-Zone Reclaiming [KJ]
Journal of Korean Institute of Information Scientists and Engineers(KIISE): Computer Systems and Theory in 2024

PATENT

Jongmoo Choi, Samuel Woo, and **Inho Song** *Republic of Korea: granted*
Method for analyzing vehicle forensic and computing device for execution the same *10-2022-0139234*

EXPERIENCE

Intern, Controller Architecture Modeling Engineer *May – Aug, 2024*
Samsung Electronics, Controller Architecture Team(CAT) San Jose, CA

Modeling and providing hardware-software co-design solutions
with NVMe FDP storage and industry-level storage system simulation

SKILLS

Programming	C/C++, Python, and Java
Hacking Systems	Linux Kernel (page cache), Filesystem (Ext4, and F2FS), and eBPF tracing
Real-world apps, benchmarks, and libraries	KVStore(RocksDB), CacheLib, YCSB, FIO, Filebench, SDPK, xNVMe, and NVMe-cli
Interfaces	NAND Flash Chip-off, Physical PCIe packet tracer, JTAG
Open source contribution	FEMU:Flash Emulator [GitHub](w.r.t FDP, ZNS SSD)

EXPERTISE

- **Half-decade years of research experience in storage systems**.
- Solid background in **controller architecture design and implementation for NAND Flash SSD and storage systems, including both industrial and academic experiences**.
  - I built **FDP(Song et al., WARP, FAST'26) and ZNS SSD emulator(Song et al., ConfZNS, SYSTOR'23)**, QEMU based platform, shows **highly accurate latency** results compared to real devices; **3.5% to 6% error rate** in relative value, **9% to 13% error rate** in absolute value.
  - During my internship in **Samsung**, I successfully **completed a device-system simulation project** directly related to Samsung's clients, **providing device solutions for their systems.** This requires not only domain expertise but also flexible communication with coworkers in Samsung.
  - Participating in both academic and industrial next-generation NAND Flash SSD research incorporating hardware/software co-design, such as **CacheLib, and RocksDB**.
  - **Contributor and maintainer in FEMU**, an open-source flash emulator. Currently, I'm upgrading FEMU to NVMe spec v2.0 and implementing FDP features, showcasing my readiness for new technologies and strong coding skills.
- **Design idea for improving end-to-end system performance** for each layers.
  - My publications [K1, I2, K3] focused on high-level design for high-performance system behavior. Paper [S4] also conveys what is the better behavior to exploit parallelism from a software perspective.
- Strong background and knowledge in operating system concept in **Linux Kernel**, **Computer Architecture**, and **Compiler**.
- Not only underlying device behavior but also practical experience for **analyzing and optimizing key-value store** core algorithm (i.e., compaction).
- Practical experience in **building an artificial intelligence** in AI contest. **Ensemble learning** model based on LightGBM, XGBoost, SVG, Random forest, **shows 94% accuracy**, ranked **13 out of 400** teams in final.

For whom may concern. I aim myself to be a highly motivated, but also discipline-driven person. I sincerely hope that you can easily understand who I am, what attitude I have towards life, not only in my research works, but also in miscellaneous achievements that I've done so far.
I'm good at learning new things in a short-term period. I started to learn NVMe FDP in my first semester as a PhD student, and this project is going to be published soon in USENIX FAST'26. I'd like to emphasize my computer architecture background and implementation skills through other activities such as CPU cache simulator and RISC-V code generator.

RESEARCH PROJECTS

Building a Big Data System with Next-generation SSD *funded by IITP (2022 – 2030)*
My key role: Based on Next-generation SSD, discovering the performance sweet spot for compaction in KVStore.

Design Tradeoff in ZNS SSD *funded by SK Hynix(2020-2022)*
My key role: I build the timing model for ZNS not only changing the number of physical unit configurations for a single zone in SSD but also considering accuracy.

Semantic-aware Vehicle Forensic
funded by Supreme Prosecutors' Office of Korea(2020-2021) and IITP(2022)
My key role: 1)Data retrieval process and 2) Data analysis in Infotainment system for Digital forensic approach using NAND Flash Chip-off and forensic tools.
Based on a holistic approach including hex-code level file system analysis to retrieving the artifacts from the vehicle, we found **critical artifacts that strongly imply the driver's or accompanying behaviors**.

ACADEMIC AWARDS AND ACHIEVEMENTS

- Academic Excellence Scholarship *Fall 2022*
- Academic Excellence Scholarship *Spring 2022*
- Graduation Excellence Award *Dankook Univ. 2022*
- Dean's List *Spring 2020*
- Academic Excellence Scholarship *Spring 2020*
- Dean's List *Fall Semester 2019*
- Academic Excellence Scholarship *Fall 2016*
- Admission Scholarship *Spring 2015*

CERTIFICATION

- **Teacher's Certificate** *Ministry of Education, Republic of Korea, 2022*
  The Secondary School Teacher(Grade II) of Information & Computer

MISCELLANEOUS ACTIVITIES

- RISC-V compiler & code generator *CS-5304 2023*
  - Basic operations, control flow, optimization(liveliness analysis, Common subexpression elimination, local and global register allocation, graph coloring, and alias anaylsis.
- Visiting Scholar (Syracuse University)
  International Joint Workshop for High-Potential Individuals Global Training Program, USA, 2022
- Bit-level CPU cache simulator [Git] *2021*
- Dankook university data analysis AI contest (Rank: 13/400) *DACON 2021*
- Camino de Santiago *Santiago Compostella, Spain, 2018*
- Military service in Republic of Korea Army *Republic of Korea, Jan. 2017 – Oct. 2018*
  - Special Warrior Certification
- **Editor**, Consulate General of the Republic of Korea in Jeddah *Jeddah, Saudi Arabia, Sep. – Dec. 2016*