

Krijn Doekemeijer

Vrije Universiteit Amsterdam, De Boelelaan 1111, 1081 HV Amsterdam, The Netherlands

krien.github.io | linkedin.com/in/krijn-doekemeijer | github.com/Krien

Computer Science PhD student, *improving performance/energy QoS of storage- and networked systems.*

EMPLOYMENT

Doctor of Philosophy in Computer Science

Dec. 2022 –

Vrije Universiteit Amsterdam (VU)

Amsterdam, The Netherlands

- Advisors: Animesh Trivedi, Balakrishnan Chandrasekaran
- Research team: Massivizing Computer Systems Group (AtLarge)
- Research focus: Computer systems, specializing in performance/energy QoS for storage- and networked systems

Software developer for the Customer Experience (CX) team

Oct. 2020 – Nov. 2021

Kaartje2Go, Working Talent

Zwolle, The Netherlands

- Focus: Setting up the Analytics pipeline, telemetry tooling and A/B test tooling
- Technologies: Full-stack web development, analytics (GA, GTM...), genetic algorithms, DevOPs (AWS, CI/CD)

EDUCATION

Vrije Universiteit Amsterdam and Universiteit van Amsterdam

Amsterdam, The Netherlands

Joint Masters degree in Computer Science (Big Data Engineering track). GA 8.9

Sep. 2020 – Aug. 2022

Utrecht University

Utrecht, The Netherlands

Bachelors degree in Computer Science (Gameteck specialization). GA 8.6

Sep. 2017 – May 2020

RESEARCH

Refereed publications

“Exploring I/O Management Performance in ZNS with ConfZNS++”, K. Doekemeijer, D. Maisenbacher, Z. Ren, N. Tehrany, M. Björling, A. Trivedi, *In Proceedings of the 17th ACM International Conference on Systems and Storage (SYSTOR’24)*, September, 2024.

“ZWAL: Rethinking Write-ahead Logs for ZNS SSDs with Zone Appends”, K. Doekemeijer, Z. Ren, N. Tehrany, A. Trivedi, *ACM SIGOPS Operating Systems Review, Volume 58, Issue 1 (SIGOPS OSR’24)*, August, 2024.

“zns-tools: An eBPF-powered, Cross-Layer Storage Profiling Tool for NVMe ZNS SSDs”, N. Tehrany, K. Doekemeijer, A. Trivedi, *In Proceedings of the 4th Workshop on Challenges and Opportunities of Efficient and Performant Storage Systems (CHEOPS’24)*, May, 2024.

“ZWAL: Rethinking Write-ahead Logs for ZNS SSDs with Zone Appends”, K. Doekemeijer, Z. Ren, N. Tehrany, A. Trivedi, *In Proceedings of the 4th Workshop on Challenges and Opportunities of Efficient and Performant Storage Systems (CHEOPS’24)*, May, 2024.

“BFQ, Multiqueue-Deadline, or Kyber? Performance Characterization of Linux Storage Schedulers in the NVMe Era”, Z. Ren, K. Doekemeijer, N. Tehrany, A. Trivedi, *In Proceedings of 15th ACM/SPEC International Conference on Performance Engineering (ICPE’24)*, May, 2024. **Winner of “Best research paper award”**.

“A Systematic Configuration Space Exploration of the Linux Kyber I/O Scheduler”, Z. Ren, K. Doekemeijer, A. Trivedi, *Companion of the 15th ACM/SPEC International Conference on Performance Engineering (ICPE’24 Companion)*, May, 2024.

“Reviving Storage Systems Education in the 21st Century — An experience report”, A. Trivedi, M. Jansen, K. Doekemeijer, S. Talluri, N. Tehrany, *In 2024 IEEE/ACM 24rd International Symposium on Cluster, Cloud and Internet Computing (CCGrid’24)*, May, 2024. **Nominated for “Best paper award”**.

“Performance Characterization of NVMe Flash Devices with Zoned Namespaces (ZNS)”, K. Doekemeijer, N. Tehrany, B. Chandrasekaran, M. Bjørling, A. Trivedi, *2023 IEEE International Conference on Cluster Computing (CLUSTER)*, October, 2023.

Preprints

“Understanding (Un)Written Contracts of NVMe ZNS Devices with `zns-tools`”, N. Tehrany, K. Doekemeijer, A. Trivedi, *arXiv:2307.11860; Computing Research Repository (CoRR)*, July, 2023.

“A Survey on the Integration of NAND Flash Storage in the Design of File Systems and the Host Storage Software Stack”, N. Tehrany, K. Doekemeijer, A. Trivedi, *arXiv:2307.11866; Computing Research Repository (CoRR)*, July, 2023.

“Key-Value Stores on Flash Storage Devices: A Survey”, K. Doekemeijer, A. Trivedi, *arXiv:2205.07975; Computing Research Repository (CoRR)*, August, 2022.

Other

Poster: “Performance Characterization of NVMe Devices with Zoned Namespaces (ZNS)”, K. Doekemeijer, N. Tehrany, B. Chandrasekaran, A. Trivedi, *ICT.OPEN* (National Dutch ICT conference), April, 2024, Utrecht, The Netherlands.

Poster: “TropoDB: Design, Implementation and Evaluation of a KV-Store for Zoned Namespace Devices”, K. Doekemeijer, A. Trivedi, *ICT.OPEN* (National Dutch ICT conference), April, 2023, Utrecht, The Netherlands.

Master thesis: “TropoDB: Design, Implementation and Evaluation of an Optimised KV-Store for NVMe Zoned Namespace Devices”, August, 2022, Amsterdam, The Netherlands. Won the **ADS thesis award** (Amsterdam Data Science).

RESEARCH PROJECTS

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|--|-----------------|
| ConfZNS++ <i>ZNS SSDs, emulator</i> | April 2024 – |
| <ul style="list-style-type: none">ConfZNS++ is the first function-accurate emulator for ZNS that incorporates realistic I/O management operations. See: https://github.com/stonet-research/confznsplusplus. | |
| ZINC <i>ZNS SSDs, I/O scheduler</i> | Oktober 2023 – |
| <ul style="list-style-type: none">ZINC is an I/O scheduler for ZNS with I/O management operations (i.e., reset and finish) as first-class citizens. See: https://github.com/stonet-research/zinc-scheduler. | |
| ZWAL <i>ZNS SSDs, KV-store, WAL</i> | July 2023 – |
| <ul style="list-style-type: none">ZWAL is a write-ahead log (WAL) redesigned to make use of the ZNS SSD append operation. It intends to leverage the performance stability of ZNS, but keep throughput at high levels with the append operation. It is build on top of SZD. See https://github.com/stonet-research/zwal. | |
| zns-tools <i>ZNS SSDs, tracing, profiling, end-to-end</i> | March 2023 – |
| <ul style="list-style-type: none">zns-tools is the first step to make an end-to-end tool to trace storage requests from application to storage. For now it traces F2FS and Btrfs activity on ZNS, but we plan to extend it. See https://github.com/stonet-research/zns-tools. | |
| TropoDB <i>ZNS SSDs, Key-value store, SPDK, raw storage</i> | February 2022 – |
| <ul style="list-style-type: none">TropoDB is an ongoing reseach project of redesigning LSM-tree KV-stores for flash SSDs. It is an implementation in user-space (using SPDK) that is originally build around ZNS SSDs. The intent is to provide a research project for each component of the LSM-tree. See: github.com/Krien/TropoDB. | |
| Simple ZNS Device (SZD) <i>ZNS SSDs, SPDK, io_uring, API</i> | February 2022 – |
| <ul style="list-style-type: none">SZD is a storage engine for NVMe (ZNS) SSDs. It uses an opinionated subset of SPDK and io_uring. See github.com/Krien/SimpleZNSDevice. | |

TALKS

Conference

“Exploring I/O Management Performance in ZNS with ConfZNS++”, *SYSTOR’24*, September, 2024, Virtual, Israel.

“ZWAL: Rethinking Write-ahead Logs for ZNS SSDs with Zone Appends”, *CHEOPS’24 at EuroSys 2024*, April, 2024, Athens, Greece.

“Performance Characterization of NVMe Flash Devices with Zoned Namespaces (ZNS)”, *CLUSTER’23*, November, 2023, Santa Fe, NM, USA.

Other

“ZWAL: Rethinking Write-ahead Logs for ZNS SSDs with Zone Appends”, *CompSys’24* (Dutch Computer Systems), May, 2024, Sint michielsgestel, The Netherlands.

“TropoDB: Design, Implementation and Evaluation of a KV-Store for Zoned Namespace Devices”, *CompSys’23* (Dutch Computer Systems), June, 2023, Soesterberg, The Netherlands.

COMMUNITY SERVICE

Reviewer:

- Paper: ACM/SPEC International Conference on Performance Engineering (ICPE) – 2024
- Paper: IEEE/ACM International Symposium on Cluster, Cloud and Internet Computing (CCGrid) – 2023–2024
- Artifact: Symposium on Operating Systems Principles (SOSP) – 2023

TEACHING, SUPERVISION

Teaching Assistant:

Distributed Systems (MSc., 2024) – Organizer for storage system lab projects
Teaching students how to design, implement and evaluate distributed systems.

Advanced Network Programming (BSc., 2023–2024) – Lead TA
Teaching students how to design, implement and evaluate network stacks (i.e., ICMP, TCP).

Storage Systems (MSc., 2023) – Lead TA
Teaching students how to design, implement and evaluate storage systems (i.e., FTL, FS, KV-store).

Systems Seminar (MSc., 2023–2024) – TA, lead TA for artifacts
Teaching students how to read/review computer systems papers and how to reproduce/review paper artifacts.

Supervision:

- Gleb Mishchenko (BSc. honours program): TBD
- Sudarsan Sivakumar (MSc. thesis): *Performance Characterization Study of NVMe Storage Over TCP* (2024).
- Darko Vujica (BSc. thesis): *Exploring Redis Persistence Modes: Introducing AOFURing, an io_uring AOF Extension* (2024).
- Vincent Kohm (BSc. thesis): *Optimizing Metadata Handling with vkFS: A Hybrid Key-Value Store File System leveraging RocksDB* (2024).
- Sudarsan Sivakumar (MSc. survey): *A survey on flash storage disaggregation: performance and quality of service considerations* (2024).