Krijn Doekemeijer

Vrije Universiteit Amsterdam, De Boelelaan 1111, 1081 HV Amsterdam, The Netherlands
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Computer Science PhD candidate, characterizing and improving performance QoS of NVMe storage.

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 characterizing and optimizing performance QoS of NVMe storage (Linux, C, C++, Python, NVMe, NVMe ZNS)

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 (Gametech specialization). GA 8.6 *Sep. 2017 – May 2020*

Research

Refereed publications

"Does Linux Provide Performance Isolation for NVMe SSDs? Configuring cgroups for I/O Control in the NVMe Era", K. Doekemeijer, Z. Ren, T. De Matteis, B. Chandrasekaran, A.Trivedi, *In 2025 IEEE International Symposium on Workload Characterization (IISWC)*, October, 2025. **Nominated for "Best paper award"**.

"Storage-Based Approximate Nearest Neighbor Search: What are the Performance Cost and I/O Characteristics?", Z. Ren, K. Doekemeijer, P. Apparao, A.Trivedi, *In 2025 IEEE International Symposium on Workload Characterization (IISWC)*, October, 2025.

"PowerSensor3: A fast and accurate open source power measurement tool", S. van der Vlugt, L. Oostrum, G. Schoonderbeek, B. van Werkhoven, B. Veenboer, K. Doekemeijer, J. Romein, *2025 IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS)*, August, 2025.

"Columbo: A Reasoning Framework for Kubernetes' Configuration Space", M. Jansen, S. Talluri, K. Doekemeijer, N. Tehrany, A. Iosup, A. Trivedi, *In Proceedings of 16th ACM/SPEC International Conference on Performance Engineering (ICPE'25)*, May, 2025.

"An I/O Characterizing Study of Offloading LLM Models and KV Caches to NVMe SSD", Z. Ren, K. Doekemeijer, T. De Matteis, C. Pinto, R. Stoica, A. Trivedi, *In Proceedings of the 5th Workshop on Challenges and Opportunities of Efficient and Performant Storage Systems (CHEOPS'25)*, March, 2025.

"Exploring I/O Management Performance in ZNS with ConfZNS++", K. Doekemeijer, D. Maisenbacher, Z. Ren, N. Tehrany, M. Bjørling, 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: "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

isol-bench | *NVMe SSDs, benchmark* January 2025 – December 2025

isol-bench is a benchmark to evaluate performance isolation of NVMe storage. See: https://github.com/stonet-research/isol-bench.

ConfZNS++ | *ZNS SSDs, emulator* April 2024 – December 2025

ConfZNS++ is the first function-accurate emulator for ZNS that incorporates realistic I/O management operations. See: https://github.com/stonet-research/confznsplusplus.

ZINC | *ZNS SSDs, I/O scheduler, kernel modules* Oktober 2023 – December 2025

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 | *ZNS SSDs, KV-store, WAL* July 2023 – December 2025

ZWAL is a write-ahead log (WAL) redesigned to make use of the ZNS SSD append operation. It intents 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 | *ZNS SSDs, tracing, profiling, end-to-end, BPF* March 2023 – December 2025

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 | *ZNS SSDs, Key-value store, SPDK, raw storage* February 2022 – August 2024

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) | *ZNS SSDs, SPDK, io_uring, API* February 2022 – December 2025

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

"Does Linux Provide Performance Isolation for NVMe SSDs? Configuring cgroups for I/O Control in the NVMe Era", *IISWC'25*, October, 2025, Irvine, CA, USA.

"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 Transactions on Storage (TOS)*, 2025

Paper: *ACM/IFIP International Middleware Conference (Middleware)*, 2025

Paper: *ACM/SPEC International Conference on Performance Engineering (ICPE)*, 2024

Paper: *IEEE/ACM International Symposium on Cluster, Cloud and Internet Computing (CCGrid)*, 2024

Paper: *ACM International Symposium on High-Performance Parallel and Distributed Computing (HPDC)*, 2023

Artifact: *Symposium on Operating Systems Principles (SOSP)*, 2023

Teaching, Supervision

Teaching Assistant:

Advanced Systems Programming (BSc., 2025) – Supporting TA
Teaching students how to design, implement and evaluate systems software (i.e., network applications, runtime systems such as NodeJS).

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., 2023–2025) – TA, lead TA for artifacts
Teaching students how to read/review computer systems papers and how to reproduce/review paper artifacts.

Supervision:

Duc Anh Phan (MSc. research project, 2025) – Daily supervisor
LLM KV Cache Performance Characterization When Using Disk Offloading for Prefix Caching.

Joseph Kanichai (MSc. thesis, 2025) – Daily supervisor
Characterizing The Energy Contribution and Energy-Performance Trade-offs of NVMe SSDs in the Linux Storage Stack.

Yigit Abaci (BSc. thesis, 2025) – Daily supervisor
A Performance Analysis of TC for High Speed, Scalable Data Center Networks.

Gleb Mishchenko (BSc. honours program, 2025) – Daily supervisor
You do not need fast NVMes for MVEs. PokeSto: A Storage Benchmark for Modifiable Virtual Environments.

Sudarsan Sivakumar (MSc. thesis, 2024) – Daily supervisor
Performance Characterization Study of NVMe Storage Over TCP.

Darko Vujica (BSc. thesis, 2024) – Daily supervisor
Exploring Redis Persistence Modes: Introducing AOFURing, an io_uring AOF Extension.

Vincent Kohm (BSc. thesis, 2024) – Daily supervisor
Optimizing Metadata Handling with vkFS: A Hybrid Key-Value Store File System leveraging RocksDB.

Sudarsan Sivakumar (MSc. survey, 2024) – Daily supervisor
A survey on flash storage disaggregation: performance and quality of service considerations.