

# Krijn Doekemeijer

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*Computer Science PhD student, characterizing and improving QoS of storage systems.*

## EMPLOYMENT

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### 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 improving QoS for storage 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

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### 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

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### 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)*, TBD, 2025.

“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)*, TBD, 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. Björling, 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

**ConfZNS++** | ZNS SSDs, emulator

April 2024 –

- 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

Oktober 2023 –

- 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 –

- 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/zwald>.

#### **zns-tools** | *ZNS SSDs, tracing, profiling, end-to-end*

March 2023 –

- 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 –

- TropoDB is an ongoing research 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](https://github.com/Krien/TropoDB).

#### **Simple ZNS Device (SZD)** | *ZNS SSDs, SPDK, io\_uring, API*

February 2022 –

- SZD is a storage engine for NVMe (ZNS) SSDs. It uses an opinionated subset of SPDK and io\_uring. See [github.com/Krien/SimpleZNSDevice](https://github.com/Krien/SimpleZNSDevice).

## TALKS

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### 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

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### 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 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:

- Joseph Kanichai (MSc. thesis): *Characterizing The Energy Contribution and Energy-Performance Trade-offs of NVMe SSDs in the Linux Storage Stack* (2025).
- Yigit Abaci (BSc. thesis): *A Performance Analysis of TC for High Speed, Scalable Data Center Networks* (2025).
- Gleb Mishchenko (BSc. honours program): *You do not need fast NVMeS for MVEs. PokeSto: A Storage Benchmark for Modifiable Virtual Environments* (2025).
- 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).