Yekang Zhan

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Education

Huazhong University of Science and Technology (HUST) **Wuhan, Hubei, China**
PhD Student in Computer Architecture and System 09/2021 – Present

- **Research Areas**: Storage Systems, File Systems, Storage I/O Stack, Dynamic I/O Scheduling
- **Achievement**: GPA 85/100, Academic Scholarships x 2

Huazhong Agricultural University (HZAU) **Wuhan, Hubei, China**
Bachelor in Computer Science and Technology 09/2017 – 06/2021

- **Achievement**: Postgraduate Recommendation Rank 2/132, Academic Scholarships x 2
- **Experiences**: ACM-ICPC Team Leader in HZAU, Technological Innovation Department

Internship

Tencent **Shenzhen, Guangdong, China**
Storage Engine Intern, TEG 04/2023 – 03/2024

- **Storage Engine R&D:** Developed a novel storage system based on emerging non-volatile memory.

Publication

Rethinking the Request-to-IO Transformation Process of File Systems for Full Utilization of High-Bandwidth SSDs
(**The First Top Tier Conference Paper on File Systems at HUST**) **FAST25, CCF-A, First Author**

AIS: An Active Idleness I/O Scheduler to Reduce Buffer-Exhausted Degradation of Solid-State Drives
(I/O Scheduling and SSD Performance Optimization) **TACO24, CCF-A, First Author**

Rearchitecting Buffered I/O in the Era of High-Bandwidth SSDs
(Storage I/O Stack Optimization and High-Performance Storage) **FAST26, CCF-A, Under Review**

RomeFS: A CXL-SSD Aware File System Exploiting Synergy of Memory-Block Dual Paths
(**The First File System Based on CXL-SSD**) **SoCC24, CCF-B, First Author**

HBtree: A Heterogeneous B+ tree with Multi-granularity for Hybrid NVM-SSD Storage
(Efficient Index Structure and Heterogeneous Storage) **IEEE NAS22, First Author**

SchInFS: A File System Integrating Functions of the Block I/O Scheduler for ZNS SSDs
(ZNS-SSD Exploition and Novel File Systems) **ICCD24, CCF-B**

HeteroGNN: A Heterogeneous Stage Division Based GNN Training Framework to Maximize CPU-GPU Parallelism
(GNN Training Acceleration and Fine-Grained Task Scheduling) **ICME25, CCF-B**

Research Experiences

Maximizing the Performance of High-Bandwidth SSDs by Utilizing Heterogeneous Low-Latency Storage (National Key Research and Development Program No.2022YFB2804302)

- Identified performance bottlenecks of the storage I/O stack and maximized storage performance.
- Achieved up to 29.76x write performance improvement and 6.79x read performance improvement compared to SOTA and related product file systems.
- Open source： https://github.com/YekangZhan/OrchFS. The paper has been published in FAST25.

A Novel File System Architecture Based on Emerging Dual-Path CXL-SSD (National Natural Science Foundation of China No.62172175)

- Analyzed the dual-path data access characteristics of CXL-SSD and devised a novel file system architecture.
- Achieved up to 14.24x performance improvement compared to SOTA and related product file systems.

- Implemented a file system prototype with approximately 14,000 LOC and a CXL-SSD simulator with approximately 3,000 LOC. The paper has been published in SoCC24.

Enhancing the Buffered I/O Performance by Leveraging High-Bandwidth SSDs (National Key Research and Development Program No.2024YFB4505105)

- Rearchitected the buffered I/O architecture to proactively exploit SSD performance while retaining all of the advantages of buffered I/O without requiring application modifications.
- Achieved up to 3.91x and 82.80x throughput and latency improvements respectively.
- This architecture has been implemented in XFS of Linux 6.8, with over 5,000 LOC, and has been submitted to FAST26 with plans for open source.

An Active Idleness Scheduler to Maximize SSD Internal Buffer Recovery (National Natural Science Foundation of China No. 61821003)

- Analyzed the SSD performance degradation problem caused by internal buffer exhaustion and established a buffer recovery model.
- Designed an SSD performance degradation predictor based on the model and implemented a block layer scheduler to overcome this problem.
- Improved SSD average I/O latency and tail latency by up to 29.3% and 78.7%, respectively, under real-world cloud storage traces. The paper has been published in TACO24.

ZB-Level Massive Cold Data Storage Architecture and Efficient Storage Management System (National Key Research and Development Program No. 2024YFB4505105)

- Designed a multi-layer data storage architecture across DRAM-SSD-HDD-CD for ZB-level massive cold data scenarios. Devised batch file processing mechanism and fast file collection and reconstruction mechanism.
- It is expected to apply for a invention patent and publish an academic paper.

Awards

The 5th China Collegiate Programming Contest (Xiangtan Station) **Silver Medal**

The 5th China Collegiate Programming Contest (Qinhuangdao Station) **Bronze Medal**

The 45th International Collegiate Programming Contest Asia Kunming Regional Contest **Bronze Medal**

The 43th International Collegiate Programming Contest Asia Qingdao Regional Contest **Bronze Medal**

The 10th Blue Bridge Cup National Software and Information Technology Professional Talent Competition
National Final: Second Prize (Top 1.5%)

The 10th Blue Bridge Cup National Software and Information Technology Professional Talent Competition
Hubei Regional Contest: First Prize (Top 10%)

The 8th ASC Student Supercomputer Challenge **Second Prize**

Research Interests

Exploring the revolution and opportunities brought by high-bandwidth SSDs to storage systems
(e.g., PCIe5.0 / PCIe6.0 SSD)

Exploring how emerging storage devices can enhance existing storage systems
(e.g., NVM/PM, CXL-SSD, ZNS-SSD, Optical Storage)

Building next-generation storage systems
(e.g., architecture and performance metric evaluation, AI for System and System for AI)