ZERUI GUO

✉ cyrus.guo@wisc.edu   ⚲ cyrus-guo.com   ⚲ Madison, WI, USA   ⚲ github.com/AlphaCat00

EDUCATION

University of Wisconsin-Madison, USA   *May. 2023 - Present*
Ph.D. student in Computer Sciences, Advisor: Ming Liu

Beihang University (BUAA), China   *Sep. 2020 - Jan. 2023*
Master of Computer Science and Technology, Advisor: Yuebin Bai,

Beijing University of Post and Telecommunications (BUPT), China   *Sep. 2016 - Jun. 2020*
Bachelor of Network Engineering, Ranking: 4/135
School Outstanding Graduate

RESEARCH INTERESTS

SmartNIC-assisted Computing, Memory Fabrics(CXL.mem)

PUBLICATIONS

Toward Predictable Memory Pooling using MemChannels   *Submitted to NSDI 2024*
<u>Zerui Guo</u>, and Ming Liu

LogNIC: A High-Level Performance Model for SmartNICs   *MICRO 2023*
<u>Zerui Guo</u>, Jiaxin Lin, Yuebin Bai, Daehyeok Kim, Michael Swift, Aditya Akella, and Ming Liu

LEED: A Low-Power, Fast Persistent Key-Value Store on SmartNIC JBOFs   *SIGCOMM 2023*
<u>Zerui Guo</u>, Hua Zhang, Chenxingyu Zhao, Yuebin Bai, Michael Swift, and Ming Liu

RESEARCH EXPERIENCE

MemChannels for Predictable Memory Pooling on CXL   *Jun. 2022 - Sep. 2023*
University of Wisconsin-Madison

- Designed and implemented a new software system abstraction, MemChannel, to achieve predictable remote memory accesses by developing a token distribution mechanism and a congestion control-based token adjustment scheme.

- Built an object-based remote memory system based on C++ smart pointers with a CLOCK-enhanced object migration engine to improve object movement efficiency and reduce relocation costs.

- Demonstrated significant improvements in predictability in memory pooling and up to $3.2\times$ performance enhancements in multi-tenancy scenarios.

A High-Level Performance Model for Programmable Network Hardware   *Feb. 2022 - Apr. 2023*
University of Wisconsin-Madison

- Introduced a packet-centric modeling approach instead of an execution flow-based one to analyze the performance characteristics of SmartNIC-offloaded programs.

- Built a comprehensive model that abstracts low-level SmartNIC device details using a hardware model and represents offloaded programs as software execution graphs for estimating both throughput and latency.

- Validated the model's capabilities, including performance limit estimations, software optimizations, and guidance for hardware design, through extensive evaluation with commodity SmartNICs and an academic prototype across diverse application scenarios.

A Low-Power, Fast Persistent Key-Value Store on SmartNIC JBOFs *Sep. 2021 - Feb. 2023*
University of Wisconsin-Madison

- Designed and implemented a circular log data structure and a DRAM/Flash hybrid indexing scheme to adapt to the highly-skewed storage hierarchy.

- Developed a token-based end-to-end I/O scheduler to prevent oversubscription of our system components by making early scheduling decisions.

- Proposed a data swapping mechanism and enhanced chain replication with request shipping capabilities to alleviate load imbalances at different levels.

- Achieved an average energy efficiency $4.2\times$ and $17.5\times$ higher than existing solutions that use beefy server JBOFs and wimpy embedded storage nodes in terms of requests per Joule.

TEACHING EXPERIENCE

Teaching Assistant, Embedded Systems, *BUAA* *2020 Fall, 2021 Spring*
Designed and conducted in-class experiments from programming the firmware to writing custom driver module in Linux.

Teaching Assistant, Wireless Network Systems, *BUAA* *2020 Fall*
Assisted with the experiment where students make custom modifications to the AODV-uu routing protocol to increase its anti-interference ability with machine learning.

Teaching Assistant, Introduction of Intelligent Car, *BUPT* *2019 Fall*
Taught around 30 students weekly about various algorithms and techniques to build an intelligent trace-tracking car. Designed assignment sheets and graded them based on the cars they build.

HONORS & AWARDS

- Second Prize, Beihang University Scholarship	*2021*
- Honorable Mention, Interdisciplinary Contest In Modeling	*2019*
- Second Prize, China "Internet plus" College Students' Innovation and Entrepreneurship Contest	*2019*
- Third Prize, The NXP Cup National University Students Intelligent Car Race	*2018*
- Second Prize, Beijing University of Post and Telecommunications Scholarship	*2016, 2017, 2018*

SKILLS

Programming:	C/C++, Python, Golang, Java, JavaScript, Julia
Frameworks & Tools:	SPDK, RDMA, Linux Networking, KVM, Docker, Pytorch, Django