

Yizhou Shan

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RESEARCH INTERESTS

My research interests span Distributed System, Operating System, and Computer Architecture, with a focus on building fast and reliable systems for datacenters. I work at Wuklab, UCSD, under the supervision of Prof. Yiying Zhang.

EDUCATION

University of California, San Diego Ph.D. in Computer Science	2019-2022
Purdue University Ph.D. in Computer Engineering (Transferred to UCSD)	2016-2019
Beijing University of Aeronautics and Astronautics B.E. in Computer Engineering	2010-2014

INDUSTRY EXPERIENCE

Microsoft Research. Research Intern Collaborators: Ziqiao Zhou, Weidong Cui, Andrew Baumann, and Marcus Peinado	Virtual. Summer 2021
VMware Research. Research Intern Collaborator: Marcos K. Aguilera	Palo Alto, CA. Summer 2019
VMware Research. Research Intern Collaborator: Stanko Novakovic	Palo Alto, CA. Summer 2018
ICT, Chinese Academy of Sciences. Research Assistant Collaborator: Zhiwei Xu, Jin Xiong, Dejun Jiang	Beijing, China. 2014-2016

PUBLICATIONS

- [7] **De-Virtualize the Virtualized Cloud for Performance and Security**
Ziqiao Zhou, **Yizhou Shan**, Weidong Cui, Xinyang Ge, Marcus Peinado, Andrew Baumann
Under Submission
- [6] **Disaggregating and Consolidating Network Functionalities with SuperNIC**
Yizhou Shan, Will Lin, Ryan Kosta, Arvind Krishnamurthy, Yiying Zhang
Under Submission Preprint: <https://arxiv.org/abs/2109.07744>.
- [5] **Clio: A Hardware-Software Co-Designed Disaggregated Memory System**
Yizhou Shan*, Zhiyuan Guo*, Xuhao Luo, Yutong Huang, Yiying Zhang (co-first authors)
ASPLOS '22 <https://arxiv.org/pdf/2108.03492.pdf>.
- [4] **Disaggregating Persistent Memory and Controlling Them Remotely: An Exploration of Passive Disaggregated Key-Value Stores**
Shin-Yeh Tsai, **Yizhou Shan**, Yiying Zhang
ATC '20

[3] Storm: a fast distributed storage system using remote memory primitives

Stanko Novakovic, **Yizhou Shan**, Aasheesh Kolli, Michael Cui, Yiyang Zhang, Haggai Eran, Liran Liss, Michael Wei, Dan Tsafir, Marcos Aguilera

SYSTOR '19 Best Paper Award

[2] LegoOS: A Disseminated, Distributed OS for Hardware Resource Disaggregation

Yizhou Shan, Yutong Huang, Yilun Chen, Yiyang Zhang

OSDI '18 Best Paper Award

[1] Distributed Shared Persistent Memory

Yizhou Shan, Shin-Yeh Tsai, Yiyang Zhang

SoCC '17

WORKSHOPS AND POSTERS

Yizhou Shan, Yutong Huang, Yiyang Zhang, “Challenges in Building and Deploying Disaggregated Persistent Memory”, 10th Annual Non-Volatile Memories Workshop (*NVMW '19*)

Yizhou Shan, Shin-Yeh Tsai, Yiyang Zhang, “Distributed Shared Persistent Memory”, 9th Annual Non-Volatile Memories Workshop (*NVMW '18*)

Yizhou Shan, Yiyang Zhang, “Disaggregating Memory with Software-Managed Virtual Cache”, the 2018 Workshop on Warehouse-scale Memory Systems (*WAMS '18*) (co-located with ASPLOS '18)

Yiyang Zhang, **Yizhou Shan**, Sumukh Hallymysore, “Disaggregated Operating System”, 17th International Workshop on High Performance Transaction Systems (*HPTS '17*)

Yizhou Shan, Yilun Chen, Yutong Huang, Sumukh Hallymysore, Yiyang Zhang, “Lego: A Distributed, Decomposed OS for Resource Disaggregation”, Poster at the 26th ACM Symposium on Operating Systems Principles (*SOSP '17*)

Yizhou Shan, Sumukh Hallymysore, Yutong Huang, Yilun Chen, Yiyang Zhang, “Disaggregated Operating System”, Poster at the ACM Symposium on Cloud Computing 2017 (*SoCC '17*)

PROFESSIONAL SERVICES

Program Committee

EuroSys '22 (Shadow PC)

EuroSys '21 (Shadow PC)

ASPLOS '21 (External PC)

Journal Review

Journal of Systems Research: 2021 - Current

ACM Transactions on Architecture and Code Optimization (TACO): 2021

ACM Transactions on Storage (TOS): 2020

IEEE/ACM Transactions on Networking: 2020

Artifact Evaluation

SOSP'21 (Artifact Evaluation)

OSDI '20 (Artifact Evaluation)

AWARDS

[2020 Facebook Fellowship Finalist](#)

SYSTOR'19 Best Paper Award

OSDI '18 Jay Lepreau Best Paper Award

OSDI '18 Student Travel Grant

SOSP '17 Student Travel Grant

SoCC '17 Student Travel Grant

RESEARCH EXPERIENCE

Network Design for Disaggregated Datacenter (Work-in-Progress) 2020-Current
UCSD

How to build a disaggregated datacenter when both the number of network ports and bandwidth requirement exploded?

We propose a way to solve this issue without disrupting the existing network infrastructure.

Programmable Disaggregated Memory System (Under Submission) 2018-Current
Purdue University and UCSD

We are building a hardware-based active disaggregated memory system using FPGA. This is a follow-up work of

LegoOS. We build a distributed hardware-based virtual memory system, and a framework for building memory services.

Serverless on Disaggregated Datacenter (WIP) 2019-Current
UCSD

We are trying to demonstrate when serverless means no server. Instead of using monolithic machines, we explore the

possibility of using a disaggregated datacenter. Instead of optimizing existing VM and container technologies, we explore

a new way to run serverless functions: using library OS.

An Operating System Inside Cloud FPGA (Concluded) 2019-2020
UCSD

We are building a new operating system inside a cloud FPGA. This new runtime overcomes the limitations of static compile-time approaches and provides a set of new services. We explored how this helps reduce cost and enable new FPGA apps.

Optimize Page Faults 2019 May-Aug
VMware Research

Ancient old page fault handling is the driving wheel for many emerging datacenter systems and applications. But the page fault handling mechanism was designed for millisecond-level disk operations, there is a performance mismatch when it is used by fast devices like RDMA, or PM. We are now trying to close the gap.

LegoOS: A Disaggregated Operating System 2017-2018
Purdue University

We propose a new OS model called the splitkernel to manage disaggregated systems. Splitkernel disseminates traditional OS functionalities into loosely-coupled monitors, each of which runs on and manages a hardware component. Using the splitkernel model, we built LegoOS, a new OS designed for hardware resource disaggregation.

Hotpot: Distributed Shared Persistent Memory 2016-2017
Purdue University

We propose Distributed Shared Persistent Memory (DSPM), a new framework for using persistent memories in datacenter environments. We designed and implemented *Hotpot*, the first DSPM system in the Linux kernel. Hotpot provides low-latency, transparent memory accesses, data persistence, data reliability and high availability.

Non-Volatile Memory (NVM) Emulator 2015-2016
Institute of Computing Technology, Chinese Academy of Sciences

We designed and implemented a NVM emulator in Linux kernel, which leverages Intel's Performance Monitoring Unit to emulate NVM's slower read/write latency and smaller bandwidth on physical DRAM. This emulator runs on bare-metal x86 machines.

ARMv8 CPU Project 2013
Institute of Computing Technology, Chinese Academy of Sciences

I participated in the Register-Transfer Level design and verification of some blocks within the cache unit and load-store unit. It is a commercial project collaborated with Huawei.

SKILLS

Languages: x86 Assembly, C, C++, Python, Scala, Rust, Go, TCL, Verilog, Java

Systems: Linux Kernel, DPDK/RDMA, KVM, QEMU, Docker, k8s, Pytorch, Tensorflow, Spark, Memcached, Vivado, Vivado HLS, Vitis, SpinalHDL, Chisel