# Yizhou Shan

Ph.D. Candidate
UCSD Computer Science and Engineering

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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** 2019-2022
Ph.D. in Computer Science

**Purdue University** 2016-2019
Ph.D. in Computer Engineering (Transferred to UCSD)

**Beijing University of Aeronautics and Astronautics** 2010-2014
B.E. in Computer Engineering

## INDUSTRY EXPERIENCE

**Microsoft Research**. Intern Virtual. 2021
Mentors: Ziqiao Zhou, Weidong Cui, Andrew Baumann, Marcus Peinado

**VMware Research**. Intern Palo Alto, CA. 2019
Mentor: Marcos K. Aguilera

**VMware Research**. Intern Palo Alto, CA. 2018
Mentor: Stanko Novakovic

**ICT, Chinese Academy of Sciences**. Research Assistant Beijing, China. 2014-2016
Mentors: Zhiwei Xu, Jin Xiong, Dejun Jiang

## 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*** ***Preprint:*** *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, Yiying Zhang, Haggai Eran, Liran Liss, Michael Wei, Dan Tsafrir, Marcos Aguilera
***SYSTOR '19*** ***Best Paper Award***

**[2] 🏆 LegoOS: A Disseminated, Distributed OS for Hardware Resource Disaggregation**
***Yizhou Shan***, Yutong Huang, Yilun Chen, Yiying Zhang
***OSDI '18*** ***Best Paper Award***

**[1] Distributed Shared Persistent Memory**
***Yizhou Shan***, Shin-Yeh Tsai, Yiying Zhang
***SoCC '17***

## WORKSHOPS AND POSTERS

**[6] Challenges in Building and Deploying Disaggregated Persistent Memory**
***Yizhou Shan***, Yutong Huang, Yiying Zhang
***NVMW '19***

**[5] Distributed Shared Persistent Memory**
***Yizhou Shan***, Shin-Yeh Tsai, Yiying Zhang
***NVMW '18***

**[4] Disaggregating Memory with Software-Managed Virtual Cache**
***Yizhou Shan***, Yiying Zhang
*2018 Workshop on Warehouse-scale Memory Systems (**WAMS '18**)*

**[3] Disaggregated Operating System**
Yiying Zhang, ***Yizhou Shan***, Sumukh Hallymysore
*17th International Workshop on High Performance Transaction Systems (**HPTS '17**)*

**[2] Lego: A Distributed, Decomposed OS for Resource Disaggregation**
***Yizhou Shan***, Yilun Chen, Yutong Huang, Sumukh Hallymysore, Yiying Zhang
*Poster at **SOSP '17***

**[1] Disaggregated Operating System**
***Yizhou Shan***, Sumukh Hallymysore, Yutong Huang, Yilun Chen, Yiying Zhang
*Poster at **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