

David H. Liu

Email: hao.liu@princeton.edu

Website: <http://www.davidhliu.com>

EDUCATION	Princeton University , Princeton, NJ <i>Ph.D.</i> in Computer Science Thesis: <i>A Serverless Architecture for Application-Level Orchestration</i>	2017 - 2023
	Duke University , Durham, NC <i>B.S.E.</i> in Electrical and Computer Engineering Minor in Mathematics	2011 - 2015
INTERESTS	I am broadly interested in systems, with both research and industry experiences in cloud computing, serverless systems, virtualization, orchestration, distributed systems, and Linux kernel drivers.	
WORK EXPERIENCE	PhD in Computer Science <i>Princeton University, SNS Network Systems Group</i> <ul style="list-style-type: none">Projects and publications in serverless computing using AWS and GCP, light-weight virtualization, information-flow control, and Android security	2017 - 2023
	Research Intern <i>Microsoft Research, Mobility and Networking Group</i> <ul style="list-style-type: none">Built and profiled serverless systems and applications on the Azure Kubernetes Service (AKS)	Summer 2020
	Software Engineer <i>Nimble Storage, Data Protocol Team</i> <ul style="list-style-type: none">Developed and maintained the Linux device driver for the new Gen 6 Fibre Channel chipsetFirm's liaison with Broadcom; led and tracked collaborative projects across companies	2015 - 2017
	Unum An orchestration system for large-scale serverless applications built on top of existing cloud services on AWS and Google Cloud Platform. Unum tackles many distributed systems challenges including consistency, exactly-once execution guarantees, and fault-tolerance. It improves programmability for complex serverless applications while significantly reducing latency and costs compared with existing orchestrators.	
	SnapFaaS A light-weight virtual machine based on the Firecracker VM by AWS Lambda. SnapFaaS leverages a snapshotting technique to quickly restore VM states and reduce cold-start latency. SnapFaaS minimizes snapshot sizes and restoration latency by carefully identifying memory pages that are actually useful for application execution. SnapFaaS examines all stages of the VM boot process, including kernel loading, operating system init, language runtime setup, and application-specific initialization.	
PROJECTS	SandTrap A dynamic information-flow tracking system on Android that performs native code taint tracking on the ARMv7 instruction set. SandTrap extends information flow control beyond JVM to native code by emulating ARMv7 instructions. SandTrap leverages memory domain to enforce per-thread memory page access privileges to preserve parallelism and minimize latency overhead.	
	SKILLS Python, Rust, JavaScript, Java, C, Kubernetes, PyTorch, Docker, KVM, AWS (Lambda, DynamoDB), GCP (Cloud Functions, Firestore), Azure (Azure Functions, Durable	

Functions), Linux kernel drivers

PUBLICATIONS **Doing More with Less: Orchestrating Serverless Applications without an Orchestrator**

David H. Liu, Amit Levy, Shadi Noghabi, Sebastian Burckhardt

Proc. 20th Symposium on Networked Systems Design and Implementation (NSDI '23), Boston, MA, April 2023

How Low Can You Go? Practical cold-start performance limits in FaaS

Yue Tan, David H. Liu, Nanqinqin Li, Amit Levy

ArXiv Technical Report:2109.13319, Sept. 2021

Pyronia: Intra-Process Access Control for IoT Applications

Marcela S. Melara, David H. Liu, Michael J. Freedman

ArXiv Technical Report:1903.01950, March 2019

SandTrap: Tracking Information Flows On Demand with Parallel Permissions

Ali Razeen, David H. Liu, Alvin R. Lebeck, Alexander Meijer, Valentin Pistol, Landon P. Cox

The 16th ACM International Conference on Mobile Systems, Applications, and Services (MobiSys '18), June 2018