Build, Measure, Repeat: Open Cloud Testbed and the Future of Experimental Computer Engineering

Abstract: In this keynote, I will introduce the Open Cloud Testbed (OCT), an NSF-funded community resource designed to accelerate experimental research in computer systems and hardware design. As our field moves toward heterogeneous, distributed, and disaggregated platforms, the credibility of results depends not only on novel ideas, but also on the ability to repeat measurements and reproduce findings.

OCT provides a shared, remotely accessible environment centered on network-attached FPGAs for advanced networking and disaggregated computing research. I will describe OCT's physical architecture and the end-to-end tool flow that enables researchers to compile designs, deploy bitstreams, configure experiments, and collect measurements. I will emphasize how OCT is engineered to support repeatability (re-running an experiment under the same conditions) and reproducibility (enabling independent groups to obtain consistent results), including controlled resource allocation, automation-friendly interfaces, experiment metadata capture, and standardized measurement workflows.

More concretely, I will present a set of representative case studies that use network-attached FPGAs as first-class experimental instruments: rapid prototyping of data-plane functions, evaluation of latency- and throughput-sensitive pipelines, and exploration of hardware/software partitioning in disaggregated settings. Throughout, I will highlight practical lessons for the research community—what to specify and publish so others can rebuild your environment, rerun your experiment, and validate your claims.

I will conclude by discussing OCT's role as interoperable infrastructure, including inter-testbed communication between FPGAs in OCT and resources in FABRIC, and how federated testbeds can enable larger-scale, multi-site experiments without sacrificing experimental rigor. My goal is to outline a path toward "build, measure, repeat" as a default standard for experimental computer engineering.

Biography: Mike Zink is the Paros Professor of Geophysical Sensing Systems in the Department of Electrical and Computer Engineering in the College of Engineering at the University of Massachusetts Amherst, where he serves as the Co-Director of the Paros Center for Atmospheric Research. His research focuses on Multimedia Systems, Cyber Infrastructure, and Large-scale Sensor Networks for Geophysical Sensing. He is PI of the NSF Open Cloud Testbed project.