



COLLOQUIUM

W201 Westgate Building (The Cybertorium)

Friday, September 21, 2:00-3:00 pm

By: Aasheesh Kolli , Penn State CSE

Title: Architecting Persistent Memory Systems

Host: Gang Tan

Abstract: Persistent Memory (PM) technologies (also known as Non-Volatile RAM, e.g., Intel's 3D XPoint) offer the exciting possibility of disk-like durability with the performance of main memory. Persistent memory systems provide applications with direct access to storage media via processor load and store instructions rather than having to rely on performance sapping software intermediaries like the operating system, aiding the development of high-performance, recoverable software. For example, I envision storage software that provides the safety and correctness of a conventional database management system like PostgreSQL and the performance of an in-memory store like Redis. However, today's computing systems have been optimized for block storage devices and cannot fully exploit the benefits of PMs. Designing efficient systems for this new storage paradigm requires a careful rethink of computer architectures, programming interfaces, and application software.

While maintaining recoverable data structures in main memory is the central appeal of persistent memories, current systems do not provide efficient mechanisms (if any) to do so. Ensuring the recoverability of these data structures requires constraining the order of PM writes, whereas current architectures are designed to reorder memory accesses, transparent to the programmer, for performance. In this talk, I will introduce recently proposed programming interfaces, called persistency models, that will allow programmers to express the required order of PM writes. Then, I will present my work on developing efficient hardware implementations to enforce the PM write order prescribed by persistency models and tailoring software for these new storage devices.

Bio:

Aasheesh Kolli is an assistant professor at Pennsylvania State University. His interests include processor architectures, memory subsystems, programming interfaces, and systems software. His recent research focuses on new opportunities and challenges arising from integrating emerging persistent memory technologies into modern computer systems. Aasheesh received his PhD (2017) and MS (2013) from the University of Michigan, and his BE (2011) from BITS-Pilani in India. His work has resulted in multiple research papers, including a best paper nomination, at venues like ISCA, MICRO, HPCA, and MICRO. He was awarded the 2018 ACM SIGARCH/IEEE CS TCCA Outstanding Dissertation Award for his work on persistent memory systems.