

# Designing systems for emerging memory technologies

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## Abstract

Currently, system software struggles with the large capacity and diversity of modern memory technologies. My primary research agenda is to build systems that address the challenges of emerging memory technologies efficiently and robustly. For example, large-scale machine learning applications want to load large datasets into memory for fast computation. For these workloads, simply adding more RAM to a machine reaches a point of diminishing returns for performance because their poor spatial locality causes them to suffer high virtual to physical memory translation costs. Ingens addresses the shortcomings in modern operating systems and hypervisors that underlies these excessive address translation overheads and redesign huge page memory systems to make huge page widely used in practice. I also implemented some of these techniques in VMwares commercial hypervisor.

Emerging non-volatile memory (NVM) technologies will have excellent performance, byte-addressability, and large capacity, blurring the line between traditional volatile DRAM and non-volatile storage. These NVM technologies diverge from DRAM in important ways, like limited write bandwidth. It is likely that future storage market will be diversified, having DRAM, NVM, SSD, and hard disk. Unfortunately, current file systems, built on top of old design ideas, cannot provide an efficient way to take advantage of the different storage media. Strata is a cross media file system, fundamentally redesigning file systems to leverage different strengths of storage technologies while compensating their weaknesses.

## Bio

Youngjin Kwon is a Ph.D. candidate at The University of Texas at Austin under supervision of Prof. Emmett Witchel and Prof. Simon Peter. His research interests lie in operating systems, including file systems, emerging storage and memory technologies, system support for security, and virtualization. His research has been recognized by VMware, and he contributed

building an initial version of his research work to VMware commercial hypervisor.

Faculty Host: Rich Martin