

R&D: OpenCXD, Open Real-Device-Guided Hybrid Evaluation Framework for CXL-SSDs

Authors present OpenCXD, a real-device-guided hybrid evaluation framework that bridges the gap between simulation and hardware.

[arXiv](#) has published an [article](#) written by Hyunsun Chung, Junhyeok Park, Taewan Noh, Seonghoon Ahn, Kihwan Kim, Sogang University, Seoul, Republic of Korea, Ming Zhao, Arizona State University, Tempe, AZ, USA, and Youngjae Kim, Sogang University, Seoul, Republic of Korea.

Abstract: *“The advent of Compute Express Link (CXL) enables SSDs to participate in the memory hierarchy as large-capacity, byte-addressable memory devices. These CXL-enabled SSDs (CXL-SSDs) offer a promising new tier between DRAM and traditional storage, combining NAND flash density with memory-like access semantics. However, evaluating the performance of CXL-SSDs remains difficult due to the lack of hardware that natively supports the [this http URL](#) protocol on SSDs. As a result, most prior work relies on hybrid simulators combining CPU models augmented with [this http URL](#) semantics and SSD simulators that approximate internal flash behaviors. While effective for early-stage exploration, this approach cannot faithfully model firmware-level interactions and low-level storage dynamics critical to CXL-SSD performance. In this paper, we present OpenCXD, a real-device-guided hybrid evaluation framework that bridges the gap between simulation and hardware. OpenCXD integrates a cycle-accurate [this http URL](#) simulator on the host side with a physical OpenSSD platform running real firmware. This enables in-situ firmware execution triggered by simulated memory requests. Through these contributions, OpenCXD reflects device-level phenomena unobservable in simulation-only setups, providing critical insights for future firmware design tailored to CXL-SSDs.”*