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July 31st, Tuesday, 2018
11:00AM - 12:00PM, Ball Hall 301

NVM-based Secure and Persistent Memory Systems

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Bio: Dr. Yu Hua is a professor in Huazhong University of Science and Technology. He was Postdoc Research Associate in McGill University in 2009, and Postdoc Research Fellow in University of Nebraska-Lincoln in 2010-2011. He obtained his B.E and Ph.D. degrees from Wuhan University respectively in 2001 and 2005. His research interests include file systems, cloud storage systems, non-volatile memory, big data analytics, etc. His papers have been published in major conferences, including USENIX FAST, USENIX ATC, ACM SoCC, SC, HPDC, ICDCS, IPDPS. He serves for multiple international conferences, including ASPLOS (ERC), SOSP (SRC&Poster), USENIX ATC, SoCC, ICS (ERC), RTSS, ICDCS, INFOCOM, IPDPS. He is the distinguished member of CCF, senior member of ACM and IEEE, and the member of USENIX. He has been appointed as the Distinguished Speaker of ACM and CCF. His homepage is at: https://csyhua.github.io

Abstract: In the non-volatile memory, ensuring the security and correctness of persistent data is fundamental. However, the security and persistence issues are usually studied independently in existing work. To achieve both data security and persistence, simply combining existing persistence schemes with memory encryption is inefficient due to crash inconsistency and significant performance degradation. To bridge the gap between security and persistence, we propose SecPM, a Secure and Persistent Memory system, which consists of a counter cache write-through (CWT) scheme and a locality-aware counter write reduction (CWR) scheme. Specifically, SecPM leverages the CWT scheme to guarantee the crash consistency via ensuring both the data and its counter are durable before the data flush completes, and leverages the CWR scheme to improve the performance via exploiting the spatial locality of counter storage, log and data writes. Experimental results demonstrate that SecPM significantly reduces the number of write requests and improves the transaction throughput by using the CWR scheme.