

Storage Security Ecosystem: A Top-down View

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ABSTRACT

In order to build a security ecosystem in storage systems, we leverage a top-down scheme to synergize bandwidth-efficient cloud storage and secure non-volatile memory. First, data deduplication is able to effectively identify and eliminate redundant data and only maintain a single copy of files and chunks. However, the occurrence of deduplication can be easily identified by monitoring and analyzing network traffic, which leads to the risk of user privacy leakage. We propose a simple yet effective scheme, called randomized redundant chunk scheme (RRCS), to significantly mitigate the risk while maintaining the high bandwidth efficiency of deduplication. Moreover, in the non-volatile memory, ensuring the security and correctness of persistent data is fundamental. 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. Experimental results demonstrate the efficiency of our proposed schemes.

BIOGRAPHY

Prof 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. He serves for multiple international conferences, including USENIX ATC, ASPLOS (ERC), SoCC, RTSS, ICDCS, ICCD, 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>

All are welcome!



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