Introduction to the Special Issue on USENIX FAST 2016

This special issue of the *ACM Transactions on Storage* presents some of the highlights of the 14th USENIX Conference on File and Storage Technologies (FAST'16). In the 14 years since its inception, FAST has grown into a very active community, attracting 115 submissions and a record number of over 550 attendees in 2016. FAST'16 continues the conference's tradition of bringing together storage-system researchers and practitioners to explore new directions in the design, implementation, evaluation, and deployment of storage systems. FAST takes a broad view of storage systems, encompassing everything from low-level storage devices to information management systems. From this broad scope, we selected four high-quality articles for publication in this special issue of *ACM Transactions on Storage*.

The first article, which was also selected as one of the best papers at the conference, is "Writes Wrought Right, and Other Adventures in File System Optimization," by Jun Yuan, Yang Zhan, William Jannen, Prashant Pandey, Amogh Akshintala, Kanchan Chandnani, Pooja Deo, Zardosht Kasheff, Leif Walsh, Michael A. Bender, Martin Farach-Colton, Rob Johnson, Bradley C. Kuszmaul, and Donald E. Porter. This article describes three enhancements to BetrFS, a file system based on a write-optimized dictionary. In its first incarnation, BetrFS achieved impressive performance gains over conventional file systems for random-writes, metadata updates, and recursive directory traversals, at the expense of worse performance on operations such as file deletion and renaming. The techniques introduced here (late-binding journaling, zoning, and range deletion) make it possible to maintain or improve on the advantages of the original BetrFS design while achieving similar performance to conventional file systems on other operations.

The second article is "Isotope: ACID Transactions for Block Storage" by Ji-Yong Shin, Mahesh Balakrishnan, Tudor Marian, and Hakim Weatherspoon. Isotope proposes an enhanced block storage, which provides high-level abstractions such as ACID transactions. The authors show that these abstractions are useful for easily building systems which are fast and robust.

The third article is "Treating the Storage Stack Like a Network" by Ioan Stefanovici, Bianca Schroeder, Greg O'Shea, and Eno Thereska. Routing abstractions can be applied to the storage stack, not only the networking stack. With this approach, the IO path can be modified according to the routing information. This flexibility results in improved performance and enables live performance debugging in a running system.

The final article, also selected as one of the best papers at the conference, is "WiscKey: Separating Keys from Values in SSD-Conscious Storage" by Lanyue Lu, Thanumalayan Sankaranarayanan Pillai, Hariharan Gopalakrishnan, Andrea C. Arpaci-Dusseau, and Remzi H. Arpaci-Dusseau. WiscKey is a persistent key-value store based on LSM-trees but designed to reduce write amplification on SSDs and leverage their internal parallelism to achieve high performance.

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