ACM Journals

CALL FOR PAPERS

ACM Transactions on Storage

Special Issue on Past, Present, and Future of Storage Technologies

Guest Editors:

- **Geoff Kuenning,** Emeritus Professor at Harvey Mudd College, geoff@cs.hmc.edu
- **Youjip Won,** Professor at the Korea Advanced Institute of Science and Technology, ywon@kaist.ac.kr
- **Ming Zhao,** Associate Professor at the Arizona State University, mingzhao@asu.edu

Editor-in-Chief

- **Erez Zadok,** Professor at Stony Brook University, ezk@cs.stonybrook.edu

Hard disks have been the dominant storage technology for over half a century. In recent years, several new technologies have emerged, with very different properties. Some of these technologies have evolved quickly and some are still years away from commercialization. We now live in an era where we have many storage devices and technologies to consider. Every time when a new technology becomes available, the entire storage stack may have to be redesigned, a process that takes years. For example, once flash-based SSDs became popular enough, they forced the redesign and new designs of I/O schedulers, file systems, operating systems, and applications.

The goal of this special issue of ACM Transactions on Storage is to provide a comprehensive description of these technologies, both new and old. Each article, discussing a specific technology, aims to provide a definitive overview of the technology's history, evolution, operation, and current and future trends. The articles in this issue can serve as a starting point to anyone interested in learning about the technology in question. This can help new students to learn about a given technology in one focused article, and researchers can learn about all the known properties and issues of such a technology to better design future storage solutions that utilize one or more of these technologies. We anticipate that this issue's articles will serve as the definitive descriptions of the covered technology at the time of its publication.

Topics

We invite academic researchers and industry professionals from a broad range of disciplines to submit to this special issue. We encourage collaborative submissions between independent research groups as well as multiple industry professionals (e.g., collaborate to submit a single comprehensive article on a given topic). Topics of interest include, but are not limited to:

- Byte-addressable storage
- Computational storage
- DNA-based storage
- Flash-based storage
- Glass- and silica-based storage

- Heat-Assisted Magnetic Recording (HAMR) storage
- Holographic storage
- Magnetic bubbles and other historical approaches that were commercial failures
- Optical storage technologies
- Persistent Memory (NVM) and Storage-Class Memory (SCM) such as Phase-Change Memory (PCM), FRAM, and STT-MRAM
- Shingled Magnetic Recording (SMR) storage
- Tape-based storage and tape robots.

Important Dates

- Abstract Submission: November 15, 2023
- Abstract Decision Notification: November 30, 2023
- Full Paper Submission: March 24, 2024
- Review decision notification (first round) R0: July 31, 2024
- Manuscript revision (one round) for the R1: September 30, 2024
- Completion of the Final Manuscript Upload: November 30, 2024
- Tentative Publication: February 2025

Submission Information

To make the process easier on authors, we break the submissions in two phases:

- Phase 1: Abstract Submission. Submit a 1 page abstract briefly describing what you plan to discuss, tentative title, and author list. Citations are not necessary at this stage. We will endeavor to review abstracts and return feedback within 1-2 weeks. To submit an abstract. Submit your paper in “acmsmall” format on the TOS mc site. However, the manuscript type must be specified as “SI: Abstract (Past, Present, and Future of Storage)”, and in the cover letter, 'This is an abstract submission to receive confirmation for the SI full paper submission.' should be mentioned.
- Phase 2: Those who receive the go-ahead to submit a full paper will be given several months to complete the full-length manuscript. See the full schedule below.

Submissions should focus on the media, and not attempt to describe everything that has ever been done related to any one media technology. Submissions should also not merely be surveys, but should also discuss past failures, if any, the pitfalls of the technology, and should include a forward-looking section about future directions. The special issue’s editors are happy to work with the authors and advise them as necessary at different stages of the full manuscript’s development.

Below is a suggested scope and structure for submissions. The list below is for illustration purposes only and may not be comprehensive. At the same time, we do not anticipate that every paper would cover every aspect listed here.

- Start by describing the physical media itself: how the technology works (e.g., individual cells, bits, or packages), mechanics, physics, magnetics, and electronics.

- Describe how the device is constructed from individual physical media units: often there would be some firmware, internal processors/controllers, channels, caches (both volatile and non-volatile); how do reads, writes, and other operations (e.g., overwrite, erase) work; internal operations such as garbage-collection, defragmentation, error correction, wear leveling, scrubbing, handling of bad blocks or other failed components.
- Describe the host-interconnect to the device and how it handles the specific media. This could include discussions of I/O busses (e.g., PCI, SATA, SCSI), memory busses, NVMe, networked and fabric-based interconnects, Compute eXpress Link (CXL), etc.
- Discuss how various operating system and storage layers have adapted or evolved to best use the media's properties as well as work around its issues. This could include discussions of I/O schedulers, file system design, block-layer, network layers, etc.
- Somewhere in the paper, it'd be useful to describe the media's history: how the technology came to be, earlier generations, successes and failures, and evolution.
- We recommend not detailing every project or paper that was ever published related to the media: rather, authors should summarize and consolidate related papers into themes.
- Next you may describe future work and trends for the media. This can help interested researchers to anticipate future needs and push the state of the art further for that media. This section could also include how existing storage stacks can be adapted to best use this media, perhaps avoiding a total redesign each time a new type of media emerges.
- Finally, we anticipate a comprehensive bibliography, as complete as possible. This is vital, to allow anyone to follow up and dive deeper into any topic described in the article.

Manuscripts submitted to the special issue should contain original material not published in nor submitted to other journals. That said, it is understood that papers in this special issue will have surveyed and summarized many previous published papers, and for the first time, discuss many papers related to a given media technology in a single paper. Each paper will be reviewed by at least three expert reviewers. Papers submitted will be reviewed in accordance with ACM's standards. Full papers should be submitted through the ACM Manuscript Central at https://mc.manuscriptcentral.com/tos. Details of the author guidelines for ACM Transactions on Storage are available at https://tos.acm.org/authors.cfm.

If you have any questions, concerns, or suggestions, feel free to reach out to the Special Issue Editors using the following email: tos23si@acm.org. We look forward to working with you and making this special issue a great success.