# NOVA: A New File System for New Memory Technologies

Non-volatile main memories (NVMMs) are poised to revolutionize I/O performance. However, block-oriented file systems (e.g., Ext4, XFS, and XFS) are unable to realize that promise. Their large software overheads and lack of strong consistency guarantee squander NVMM performance and make building mission-critical software very difficult. Existing NVMM file systems (e.g., Ext4-DAX and PMFS) also fail to provide strong consistency and fall short in terms of performance.

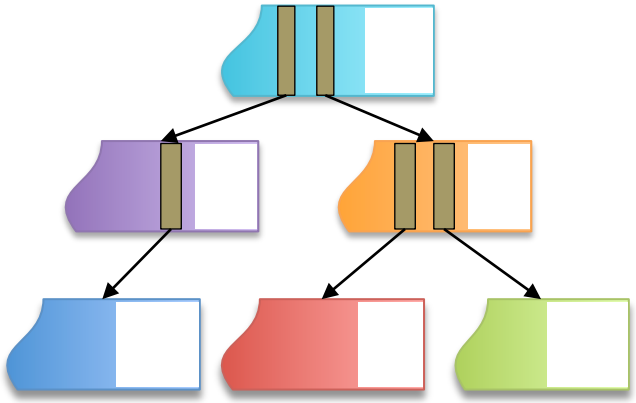
The ***NOVA*** (***NOn-Volatile memory Accelerated***) file system solves both problems: It provides higher performance than any other NVMM file system *and* full atomicity for all file and directory operations.

## A New Kind of Log-Structured File System

NOVA is a new kind of log-structured file system. It combines three innovations to take full advantage of NVMMs:

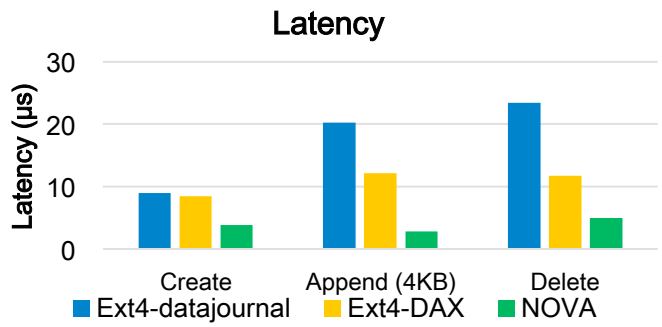
- NOVA gives each file and directory a private log, allowing NOVA to operate on files and directories without contending for any shared resources.
- NOVA logs only metadata, not file data. This keeps the log small, makes garbage collection efficient, and recovery very fast.
- NOVA uses lightweight journaling to provide atomicity for complex operations.

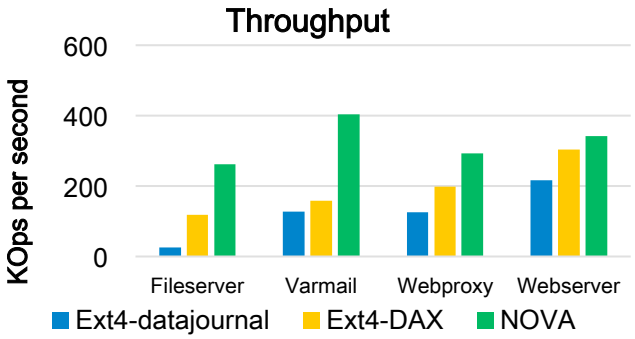
Combined, these changes represent a new approach to file system design that is tailored specifically for NVMMs.



## The World's Fastest POSIX File System

These innovations make NOVA the world's fastest POSIX file system. It out-performs all other Linux file system by a wide margin across many applications.




## NOVA is Free

NOVA runs under Linux 4.4 and is licensed under the GPL.

Download it at http://github.com/NVSL/NOVA.

## For More Information

NVSL
Non-volatile Systems Laboratory
Computer Science & Engineering • Univ. of California, San Diego

Contact Professor Steven Swanson (swanson@cs.ucsd.edu) or download the technical paper that describes NOVA:

Jian Xu and Steven Swanson. 2016. NOVA: a log-structured file system for hybrid volatile/non-volatile main memories. In *Proceedings of the 14th Usenix Conference on File and Storage Technologies* (FAST'16). USENIX Association, Berkeley, CA, USA, 323-338 (http://cseweb.ucsd.edu/users/swanson/papers/FAST2016NOVA.pdf)