**Title:** PapyrusKV: A High-Performance Parallel Key-Value Store for Distributed NVM Architectures

**Achievement:** Developed a novel parallel key-value store for high-performance computing systems equipped with distributed nonvolatile memory storages

**Significance and Impact:** This work enhances our ability to effectively utilize emerging NVM technologies, which the upcoming DOE systems all have.

**Research Details**

- PapyrusKV is a novel embedded KVS implemented specifically for HPC architectures and applications to provide scalability, replication, consistency, and high performance, and so that they can be customized by the application.
- PapyrusKV delivers high write and read performance by exploiting LSM-trees oriented for high write performance and NVMs that provide high-speed random access.
- PapyrusKV provides configurable consistency technique controlled by the application during the program execution dynamically to meet application-specific requirements and/or needs.
- PapyrusKV supports fault tolerance and streamlined workflow by leveraging NVM's persistence property.
- We empirically evaluate PapyrusKV on three different HPC systems (OLCF's Summitdev, TACC's Stampede, and NERSC's Cori), which are equipped with different NVM architectures, using microbenchmarks and a real HPC application (Merafulous) to demonstrate its portability, scalability, and performance.

**Facility:** OLCF's Summitdev, TACC’s Stampede, NERSC’s Cori

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**Summary:** PapyrusKV is a parallel embedded key-value store (KVS) for distributed high-performance computing (HPC) architectures that offer potentially massive pools of nonvolatile memory (NVM). PapyrusKV stores keys with their values in arbitrary byte arrays across multiple NVMs in a distributed system. PapyrusKV provides standard KVS operations such as put, get, and delete. More importantly, PapyrusKV provides advanced features for HPC such as dynamic consistency control, zero-copy workflow, and asynchronous checkpoint/restart. Beyond filesystems, PapyrusKV provides HPC programmers with a high-level interface to exploit distributed NVM in the system, and it transparently organizes data to achieve high performance. Also, it allows HPC applications to specialize PapyrusKV to meet their specific requirements.