High-Performance Key-Value Store for HPC Systems

Achievement: Developed Memcached for HPC Systems and provided solutions addressing the challenges to develop a key-value store for HPC systems.

Significance and Impact: This work demonstrates that an efficient key-value store can be developed for HPC systems by taking advantage of high-performing network and software abstractions available in the HPC systems.

Sponsor/Facility: ORNL, DOD, FSU

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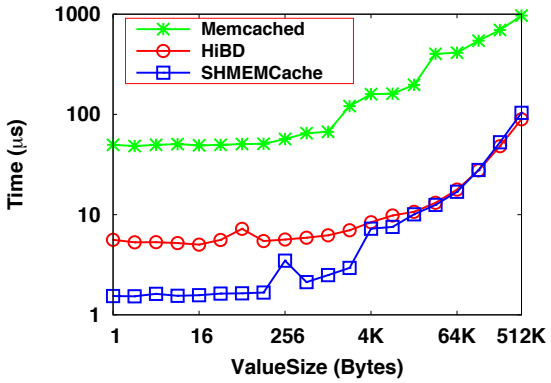
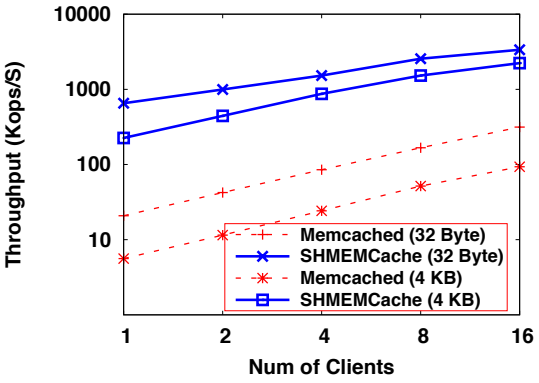
Overview:

There has been growing interest in enabling fast data analytics by leveraging system capabilities from large-scale high-performance computing (HPC) systems. OpenSHMEM is a popular programming model for HPC systems that has been used for large-scale compute-intensive scientific applications. In this work, we leverage OpenSHMEM to design a distributed in-memory key-value store for fast data analytics. To evaluate the idea, we develop SHMEMCache that takes advantage of OpenSHMEM's symmetric global memory, efficient one-sided communication operations and general portability. The results show that SHMEMCache outperforms in terms of latency and throughput over the original Memcached (shown in the graphs below). Our initial scalability test on the Titan supercomputer has also demonstrated that SHMEMCache can scale to 256 nodes and beyond.