CS554 Project Ideas

FusionFS:Lib – Improving FusionFS Performance through User-level Library Interfaces

Overview

FusionFS [1] is a new distributed file system designed for exascale systems. FusionFS achieves a scalable data and metadata throughput by co-locating the storage to its computation, as well as a completely distributed metadata management component built upon ZHT [2]. A key issue in the current implementation of FusionFS is that it requires the FUSE kernel module to support the POSIX interface, wherein extra user-kernel context switches are introduced that result in huge overhead. In this project, you will implement a user-level library FusionFS+ to bypass the FUSE module, so that the performance could be further improved. We expect to integrate this implementation in the next release of FusionFS.

Relevant Systems and Reading Material

Please refer to the following papers for the current status of this project:

[1] Dongfang Zhao, Zhao Zhang, Xiaobing Zhou, Tonglin Li, Ke Wang, Dries Kimpe, Philip Carns, Robert Ross, and Ioan Raicu. "FusionFS: Towards Supporting Data-Intensive Scientific Applications on Extreme-Scale High-Performance Computing Systems", IEEE International Conference on Big Data, 2014.

> Available online: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=7004214

[2] Tonglin Li, Xiaobing Zhou, Kevin Brandstatter, Dongfang Zhao, Ke Wang, Anupam Rajendran, Zhao Zhang, Ioan Raicu. ZHT: A Light-weight Reliable Persistent Dynamic Scalable Zero-hop Distributed Hash Table, *IEEE International Parallel & Distributed Processing Symposium*, 2013.

> Available online: http://datasys.cs.iit.edu/~dongfang/download/2013_IPDPS13_ZHT.pdf

Preferred/Required Skills

- Principles: operating system, distributed systems, computer network, key-value stores
- Programming: Shell Script, Perl/Python, C, C++, PThread, sockets
- Operating systems: Linux

Evaluation and Metrics

It is expected that FusionFS+ will be compared to FusionFS for both metadata intensive operations, and I/O intensive operations a variety of workloads; experiments are expected to be conducted on the Amazon EC2 cloud on up to 128 VM instances.

Project Mentor

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