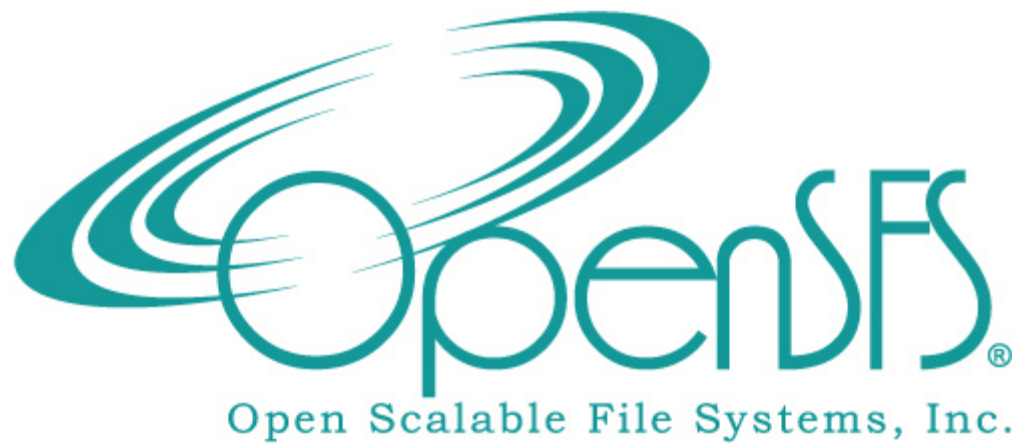




OpenSFS

Space Quota Accounting and Enforcement

Technical Specification

Version 1.0

OpenSFS Solicitation CX589

April 4, 2011

Background

The work described herein is in support of foundational changes to the Lustre file system, which will allow Lustre to be based upon a variety of underlying file systems. In particular it addresses the space quota accounting and enforcement mechanisms within Lustre.

Lustre currently fully leverages the built-in quota mechanisms implemented its underlying ldiskfs file system. This greatly simplifies both quota accounting and enforcement. As the scalability and resiliency limitations of ldiskfs directly impact the scalability and resiliency of the Lustre file system, the tight coupling between Lustre and ldiskfs needs to be refactored to allow next-generation file systems to provide the backing store for Lustre. Lustre cannot rely on the existence of underlying quota mechanisms in future alternative file system foundations.

This Technical Specification describes the work necessary to remove Lustre's dependency on underlying quota implementations. It is important to note that only space (not inode) accounting and enforcement is within the scope of this Technical Specification.

1.0 Space Quota Accounting

The Lustre parallel file system currently depends on the internal space quota accounting implementation within ldiskfs for both OSTs and MDTs. This functionality provides an accounting of the space used by file system users. The Offeror shall restructure Lustre space quota accounting to add support for next-generation file systems that may not provide quota support.

The following objectives for the Space Quota Accounting shall be met by Offeror's solution:

- Offeror shall create a design for space quota accounting capable of operation upon multiple backend file systems ,that may not provide quota support.
- Offeror shall modify the Lustre MDT and OST code base to implement space quota accounting upon multiple backend file systems including without relying upon quota functionality within the underlying file system.
- Space quota accounting changes shall be demonstrated using ldiskfs and one non-ldiskfs backing file system.
- Space quota accounting will be supported in the Offeror's product branch.

1.1 Deliverables

- 1.1.1 Design documents detailing the Lustre space quota accounting restructuring.
Completion: Start of Contract + 1 month
- 1.1.2 Initial prototype delivery of Lustre with restructured space accounting functionality. Delivery shall be on Offeror's project branch.
Completion: Start of Contract + 4 months
- 1.1.3 Final delivery of Lustre with restructured space quota accounting. The final delivery shall, at a minimum, support all previously supported space quota accounting functionality while maintaining the overall stability and functionality of the Lustre file system. The final delivery shall be a supported product by Offeror.
Completion: Start of Contract + 6 months
- 1.1.4 Demonstration of Lustre with restructured space quota accounting. Offeror shall be provided access to a system to run functionality and performance demonstration of space accounting atop both ldiskfs and one alternative file system foundation.
Completion: Start of Contract + 7 months

2.0 Space Quota Enforcement

The Lustre parallel file system currently depends on the internal space quota enforcement implementation within ldiskfs for both OSTs and MDTs. This functionality enforces administrator set limits on the space used by file system users. The Offeror shall restructure Lustre space quota enforcement to add support for next-generation file systems that may not provide quota support.

The following objectives for the Space Quota Enforcement shall be met by Offeror's solution:

- Offeror shall create a design for space quota enforcement capable of operation upon multiple backend file systems that may not provide quota support.
- Offeror shall modify the Lustre MDT and OST code base to implement space quota enforcement upon multiple backend file systems without relying upon quota functionality within the underlying file system.
- Space quota enforcement shall be demonstrated using ldiskfs and one non-ldiskfs backing file system.

- Space quota enforcement will be supported in the Offeror's product branch.

2.1 Deliverables

- 2.1.1 Design documents detailing the Lustre space quota enforcement restructuring.

Completion: Start of Contract + 1 month

- 2.1.2 Initial prototype delivery of Lustre with restructured space quota enforcement functionality. Delivery shall be on Offeror's project branch.

Completion: Start of Contract + 4 months

- 2.1.3 Final delivery of Lustre with restructured space quota enforcement. The final delivery shall, at a minimum, support all previously supported space quota enforcement functionality while maintaining the overall stability and functionality of the Lustre file system. The final delivery shall be a supported product by Offeror.

Completion: Start of Contract + 6 months

- 2.1.4 Demonstration of Lustre with restructured space quota enforcement. Offeror shall be provided access to a system to run a functionality and performance demonstration of space enforcement atop both Idiskfs and one alternative file system foundation.

Completion: Start of Contract + 7 months

3.0 Execution

3.1 Management and Reporting

Management oversight is important for keeping activities on track and within scope. As part of each deliverable, the Offeror shall exercise due diligence in management activities, including regular attendance and participation in management meetings as described below.

Weekly technical management: Once per week, the Offeror's technical representative(s) shall meet with OpenSFS's technical teams and Offeror's technical team to discuss progress on tasks detailed within this document. The Offeror shall provide current status on all tasks and be prepared to discuss current status in technical detail. Any resource dependencies, such as access to OpenSFS testing equipment must be identified in this meeting.

The Offeror shall submit a monthly progress report no less than two business days after the last day of each month detailing progress made on each deliverable. The Offeror shall provide documentation of completion for each deliverable prior to billing. OpenSFS's technical representative must document completion of a deliverable in order for it to be considered complete.

The Offeror (Project Manager or Support Senior Manager) shall attend quarterly executive management meetings with OpenSFS management to discuss progress on work items as well as broader architectural issues on the Lustre technology, including technical detail and forward-looking feature development. The communication method for these meetings (e.g face-to-face, conference call, etc.) shall be determined by mutual agreement.

3.2 Software Licensing and Source Code

All software developed and data generated within the scope of this agreement are subject to the OpenSFS contributor agreement. Offeror shall also release all developed and modified code via GPL V2 or other open source license reasonably designated by OpenSFS. Source code for all software developed under this agreement shall be hosted at a repository as specified by OpenSFS.

3.3 Lustre Software Enhancements

All changes to Lustre software shall be made available in a production release of Lustre 2.x except where otherwise noted. All changes to Lustre must pass OpenSFS's Lustre test suite (negotiated with Offeror) in order to successfully complete delivery milestones. It is desired that Offeror's changes to the Lustre file system shall be backward compatible with non-enhanced Lustre clients, servers, and routers.

3.4 Access to Hardware Resources

Access to facilities and equipment required to facilitate the work to be performed may be negotiated.