Lustre User Group 2009

Lustre 2.0 Features

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2.0 Features List

- Metadata ChangeLogs
- Replication
- Commit on Share
- Simplified Interoperability
- Clustered Metadata Preview
- Kerberos Preview
Lustre 2.0 Architecture

New platform for future development
- MDS rewrite: CMD, ZFS, portable
- Client IO rewrite: SMP, simpler, portable
- ChangeLogs: replication, backup, HSM

Target scale: HPCS 2012+
- 100PB+ data, 1T files
- 100k nodes, 1M processor cores
- End-to-end data integrity
MDS Rewrite

- New MDS stack independent of VFS
- FIDs abstracted from backing inodes
- Allows CMD functionality
- Portable to Solaris kernel
- Allows layering on top of ZFS
- Future client MD writeback cache
Client IO Rewrite

- Client IO stack separated from VFS
- Portable to Windows, Solaris, OS/X
- Designed to allow future features
  - Server Network Striping (SNS==RAID)
  - SMP scalability, multi-core optimization
Metadata ChangeLogs

- Provides stream of server changes
- Persistent and atomic
- Filtered in kernel
- Can register multiple consumers
- Single log for all consumers
- Configured on server (for security)
- Can be consumed on client
Replication

- First Metadata ChangeLog consumer
- Keep a remote filesystem in sync
  - Incremental Backup
  - Read-only mirror
- Target not required to be Lustre
Commit On Share

- Improved Recoverability
- Remove inter-node dependency
- With VBR no dependent failures
- Performance impact only as needed
Simplified Interoperability

- Important for live upgrade process
- Reduces interoperability matrix
  - Removes recovery from interoperation
- Shutdown notification
  - Server notifies clients of impending shutdown
  - Clients flush buffers and block ops
- No recovery during normal unmount
Clustered Metadata Preview

- Scale metadata performance like IO
- Complements single-MDS speedups
- Create, unlink, lookup, getattr scaling
- 2.0 preview missing some features
  - Full power-off recovery of cross-MDS ops
  - Some usability features (pools, striping)
  - May still optimize on-disk format
- Production debut with simple recovery
  - Ordered synchronous cross-MDS ops
  - Rename, hard-link, mkdir may be slower
Kerberos Security Preview

- Kerberos user authentication
- Authentication, encryption of RPCs
- Authentication, encryption of data

- Undergoing security review
- Capabilities still unfinished
Lustre 2.0 Alpha

• Early availability to 2.0 features
  • For test filesystems only
  • Has undergone reasonable testing
• Regular builds will be made available
  • Current build v1_9_167 available today
  • Next build scheduled for May 9
Lustre 2.x and 3.0

Focus: Performance & reliability for HPC

- Performance features
  - Ongoing IO and MD performance gains
  - Size on MDS, CMD production
  - OSS write cache
  - Network Request Scheduler (NRS)
- Reliability features
  - ZFS for checksums, redundancy, scale
  - Kerberos Security production
- Information Management
  - HSM support (HPSS, SAM)
  - ZFS for backups, snapshots
THANK YOU
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