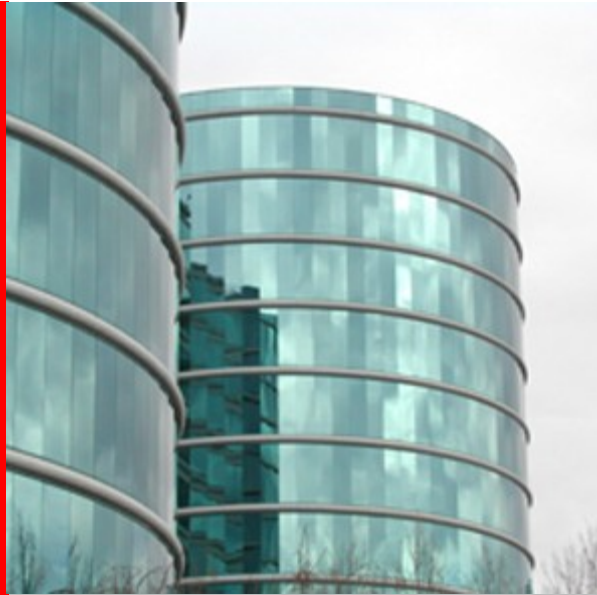


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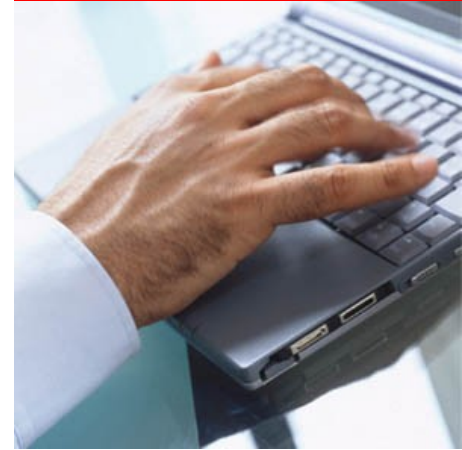


Lustre Tricks You Probably Didn't Know

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Program **Agenda**

- Power *lfs find* Usage
- Tools for Pools
- *filefrag* Reveals Fragmentation
- Interesting Tunables
- Recovery Tools



Power *lfs find* usage

lfs_migrate script

- Useful for rebalancing OST space usage
- Simple migration script *lfs_migrate*
- At most basic is simple copy + rename operation

```
#!/bin/bash
while read F ; do
    cp -a "$F" "$F.tmp" &&
    mv -v "$F.tmp" "$F"
done
```

- NOT currently safe for open or in-use files
- Version in manual, better version in bug 22481
- Hopefully will be in 1.8.4, and/or 2.0

Power *lfs find* usage

OST rebalancing

- OST000[2,4] too full, within the last couple of days

```
client$ lfs find /myth -type f -mtime -2 -size +2G  
-obd myth-OST0002 -obd myth-OST0004 | lfs_migrate
```

- OST000{5,6} are new/less full, move files TO them

```
$ lfs find /myth -mtime +90 -size +20G -name "*.iso"  
! -obd myth-OST0005 ! -obd myth-OST0006 |  
lfs_migrate
```

Tools for Pools

Basic Commands

- Create a dedicated OST pool for classes of files

```
mgs# lctl pool_new myth.audio
mgs# lctl pool_add myth.audio OST0004
mgs# lctl pool_new myth.video
mgs# lctl pool_add myth.video OST000[0-3]
client$ lctl pool_list myth.video
Pool: myth.video
myth-OST0000_UUID
myth-OST0001_UUID
myth-OST0002_UUID
myth-OST0003_UUID
```

Tools for Pools

Other Commands

- Many Lustre tools have pools support

```
client$ lfs df -p myth.audio
```

UUID	1K-blocks	Used	Available	Use%	Mounted on
myth-MDT0000	9174328	178572	8471468	1%	/myth[MDT:0]
myth-OST0004	721984264	653299296	68684904	90%	/myth[OST:4]
Summary:	721984264	653299296	68684904	90%	/myth

```
client$ lfs find -p myth.audio -uid ...
```

- Returns files created in myth.audio, not just OST0004

filefrag Reveals Fragmentation

- Can see layout of objects on OSTs

```
client$ filefrag -v tv/kids/foo.mpg
```

```
File size of tv/kids/foo.mpg is 1015406592 (991608  
blocks of 1024 bytes)
```

```
ext: device_logical:    physical_offset: length:  dev:  
  0:      0..    2047:      45056.. 47103:    2048: 0000:  
  1:  2048..    4095:      38912.. 40959:    2048: 0000:  
...  
 14:      0..     735: 78300068..78300803:    736: 0004:  
 15:  736..   1023: 70399296..70399583:    288: 0004:  
...  
tv/kids/foo.mpg: 49 extents found
```


Interesting Tunables

get_param and set_param

- Direct /proc access is discouraged
 - Use *lctl get_param* and *lctl set_param* for portability
 - Names map directly onto /proc/{sys,fs}/{lustre,lnet}/pathname

```
$ lctl get_param version  #/proc/sys/lustre/version
version=
lustre: 1.8.2.53
kernel: 47
build: 1.8.2.53-CHANGED-2.6.16.46-0.15
```

- Avoids need for scripts to set multiple parameters

```
client$ lctl set_param osc.*.max_dirty_mb=32
osc.myth-OST0000-osc.max_dirty_mb=32
osc.myth-OST0001-osc.max_dirty_mb=32
```

Interesting Tunables

How to List Tunables without *ls /proc*

```
client$ lctl get_param -NF osc.*.*
lctl get_param -NF llite.*.*
llite.myth-ffff88006c8cc000.blocksize
llite.myth-ffff88006c8cc000.checksum_pages=
llite.myth-ffff88006c8cc000.contention_seconds=
llite.myth-ffff88006c8cc000.direct_io_default=
llite.myth-ffff88006c8cc000.dump_page_cache
llite.myth-ffff88006c8cc000.extents_stats=
llite.myth-
    ffff88006c8cc000.extents_stats_per_process=
...
```

Interesting Tunables

Client Import State

```
client$ lctl get_param osc.*.import
osc.myth-OST0000-osc.import=
import:
  name: myth-OST0000
  target: myth-OST0000_UUID
  current_connection: 192.168.20.1@tcp
  state: FULL
  connect_flags: [write_grant,
server_lock, ..., early_lock_cancel,
adaptive_timeouts, lru_resize,
alt_checksum_algorithm, version_recovery]
  import_flags: [replayable, pingable]
```

Interesting Tunables

Client Import State, cont.

connection:

connection_attempts: 69

generation: 1

in-progress_invalidations: 0

rpcs:

inflight: 0

unregistering: 0

timeouts: 67

avg_waittime: 32234 usec

service_estimates:

services: 1 sec

network: 1 sec

Interesting Tunables

Client Import State, still cont.

transactions:

last_replay: 0

peer_committed: 55834582048

last_checked: 55834582048

read_data_averages:

bytes_per_rpc: 829101

usec_per_rpc: 33809

MB_per_sec: 24.52

write_data_averages:

bytes_per_rpc: 605745

usec_per_rpc: 41162

MB_per_sec: 14.71

Interesting Tunables

Server Export State

- Per-client `brw_stats`

```
oss$ lctl get_param obdfilter.*.exports.*.brw_stats
```

- See which client NIDs are connected

```
mds$ lctl get_param -NF mds.*.exports.*
```

```
mds.myth-MDT0000.exports.192.168.20.153@tcp/
```

```
mds.myth-MDT0000.exports.192.168.20.159@tcp/
```

```
mds.myth-MDT0000.exports.clear=
```

Interesting Tunables

Server Export State, cont.

- Map client UUIDs to NIDs

```
mds$ lctl get_param mds.*.exports.*.uuid
mds.myth-MDT0000.exports.192.168.20.153@tcp.uuid=
    31007da1-a19f-6537-15df-8a6cbc6f9342
mds.myth-MDT0000.exports.192.168.20.159@tcp.uuid=
    99ca0c3f-f91b-8ee6-28c2-891101d95256
```

- Evict clients by UUID

```
mds# lctl set_param mds.*.evict_client=
    31007da1-a19f-6537-15df-8a6cbc6f9342
```

- Evict clients by NID

```
mds# lctl set_param mds.*.evict_client=
    nid:192.168.20.153@tcp
```

Interesting Tunables

Cache Tuning

- Limit client-side memory usage

```
client# lctl get_param llite.*.max_cached_mb
llite.myth-ffff88006c8cc000.max_cached_mb=1501
client# lctl set_param llite.*.max_cached_mb=512
llite.myth-ffff88006c8cc000.max_cached_mb=512
```

- Read entire “small” file into cache on first access

```
client# lctl set_param
  llite.*.max_read_ahead_whole_mb=5.5
client# lctl set_param
  llite.*.max_read_ahead_per_file_mb=10
```

- Cache only files < 6MB on OSS, avoid cache thrashing

```
oss# lctl set_param
  obdfilter.*.readcache_max_filesize=6M
```


Interesting Tunables

Permanently Storing Tunables

- Permanently store parameter in configuration file
 - Has a slightly different syntax than `get_param`, `set_param`
 - Immediately sent to all clients

```
mgs# lctl conf_param {fsname}.{subsys}.{param}
```

```
mgs# lctl conf_param
```

```
    myth.obdfilter.readcache_max_filesize=6M
```

```
mgs# lctl conf_param
```

```
    myth.llite.max_read_ahead_whole_mb=5.5
```

```
client# dmesg | tail -1
```

```
Lustre: Setting parameter
```

```
    myth-client.llite.max_read_ahead_whole_mb
```

```
in log myth-client
```

Recovery Tools

lustre enhanced tar

- Small change to RH/FC tar to backup/restore lustre xattrs
- Accepted upstream into FC13, hopefully RHEL6
- Restores stripe_{count,size,pool} *before* restoring data

```
client# lfs getstripe -c *stripe
```

```
1stripe: 1
```

```
2stripe: 2
```

```
3stripe: 3
```

```
client# tar czf - --xattr * | tar xzvf - -C tmp/
```

```
client# lfs getstripe -c *stripe
```

```
tmp/1stripe: 1
```

```
tmp/2stripe: 2
```

```
tmp/3stripe: 3
```

Recovery Tools

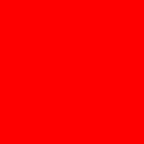
`ll_recover_lost_found_objs`

- `fid` xattr set on every OST object on first client access
- Useful in case of OST corruption, and later `fsck`
- `e2fsck` moves unreferenced inodes to `lost+found`
- `ll_recover_lost_found_objs` gets object ID from `fid`
- Rebuilds `O/0/d{0,31}` directory hierarchy, `LAST_ID` file
- OST mount creates most other files (especially `last_rcvd`)

```
oss# mount -t ldiskfs /dev/vgmyth/lvmythost0 /mnt
oss# ll_recover_lost_found_objs -d /mnt/lost+found
oss# umount /mnt
```



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