DE LA RECHERCHE À L'INDUSTRIE

SHINE

Open source Lustre administration tool

LAD 2012 | Aurélien Degrémont

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www.cea.fr

AGENDA

Objectives

What is it?

Architecture

First filesystem

Features

- Status
- Tuning
- Update
- And more...

Performance & Scalability

Future releases

OBJECTIVES

- Help using Lustre without requiring deep Lustre knowledge
  - Lustre commands are not so easy
  - Tuning also
- Necessary to write your own scripts to wrap Lustre commands

- Shine developement is driven by the following targets:
  - Manage Lustre filesystem life cycle
  - Simple and easy to use
  - Fast and scalable

WHAT IS IT?

Shine is an open source Python-based tool

- Licensed under GPL v2
- Distributed model
  - Is executed on management node and remote nodes
- Event based
- Website
  - http://lustre-shine.sf.net/

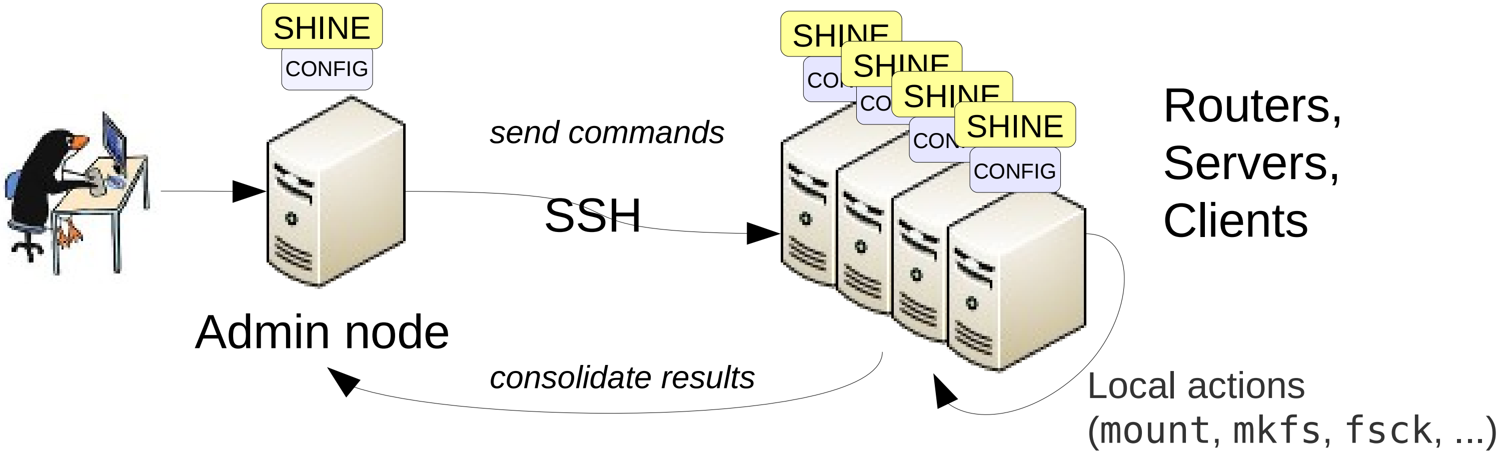
- Requirements
  - Python 2.4 to 2.7
  - ClusterShell 1.5.1+
    - Rely on it for command execution
  - Tested on RHEL 5 & 6 and Fedora 12+
  - Support any Lustre version starting from 1.6, including 2.x

WHAT IS IT?

- Preparation
  - Lustre RPMs should be installed
  - LNET should be set up correctly
  - Target devices should be usable

- Installation
  - 2 RPMs on each node
    - shine
    - clustershell
  - SSH setup on each node, without password
    - Heavily rely on your existing SSH infrastructure
  - Nothing else!
    - No complex communication daemons
    - No configuration files, no key

ARCHITECTURE

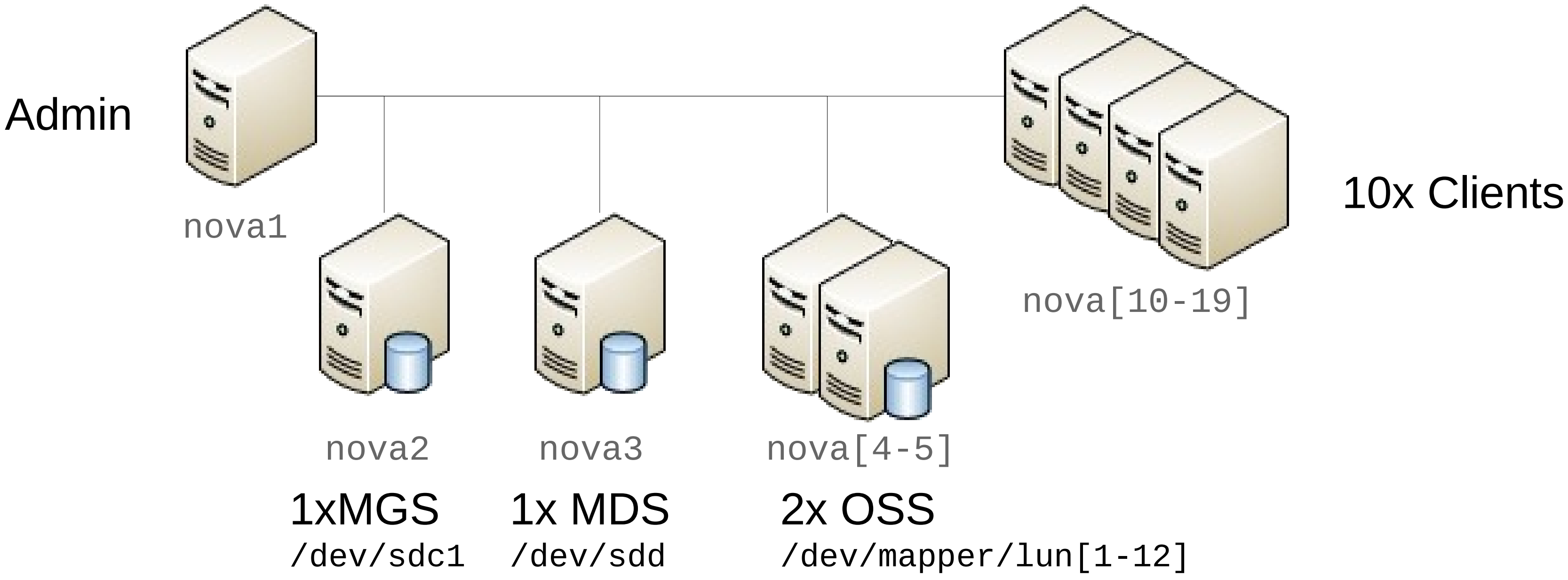


- Setup
  - Shine is deployed on management and all Lustre nodes
  - Shine replicates filesystem configuration on all filesystem nodes
- Interface
  - Admins control the filesystem through a central point of management
    - Shine will connect to required nodes transparently
  - Or run locally on remote node for local actions only.

FIRST FILESYSTEM

FIRST FILESYSTEM

Demo configuration



- Demo cluster configuration with:
  - 1 management node
  - 4 I/O servers with dedicaded storage drives
  - 10 Lustre clients

FIRST FILESYSTEM

Model file

- Lustre filesystem components are described in a configuration file called a *model*.
- This model should include:
  - File system name

```
fs_name: lad
```

  - NID/node mapping

```
nid_map: nodes=nova[2-5] nids=nova[2-5]@tcp0
```

  - Device per target type

```
# MGS
mgt: node=nova2 dev=/dev/sde1

# MDT
mdt: node=nova3 dev=/dev/sdf

# OST
ost: node=nova4 ha_node=nova5 dev=/dev/mapper/lun[1-6]
ost: node=nova5 ha_node=nova4 dev=/dev/mapper/lun[7-12]
```

  - Clients and mount path

```
client: node=nova[10-19]
mount_path: /mnt/lad2012
```

- And that's sufficient!

FIRST FILESYSTEM

Install the model and use it!

- Install it to copy the model file as configuration file where needed.

```
# shine install -m /etc/shine/models/lad.lmf
Using Lustre model file /etc/shine/models/lad.lmf
Configuration files for file system `lad' have been installed successfully on nova[2-5,10-19]
Lustre targets summary:
        1 MGT on nova2
        1 MDT on nova3
       12 OST on nova[4-5]
Use `shine format -f lad' to initialize the file system.
```

- Format
  - No issue with MGS NIDs or failover NIDs.

```
# shine format -f lad
Format lad on nova[2-5]: are you sure? (y)es/(N)o: y
Starting format of 14 targets on nova[2-5]
 FILESYSTEM STATUS (lad)
TYPE  # STATUS  NODES
----  - ------  -----
MGT   1 offline nova2
MDT   1 offline nova3
OST  12 offline nova[4-5]
```

FIRST FILESYSTEM

Start everything!

- Start the server part

  - It takes care of starting in right order and OST in parallel

```
# shine start -f lad
Starting 12 targets of lad on nova[2-5]
Start successful.
 FILESYSTEM STATUS (lad)
TYPE   # STATUS NODES
----   - ------ -----
MGT    1 online nova2
MDT    1 online nova3
OST   12 online nova[4-5]
```

- Client can now be mounted

  - Also started in parallel

```
# shine mount -f lad
Starting lad clients on nova[10-19]...
Mount successful on nova[10-19]
```

FEATURES

STATUS

High control on display

- Display consolidate and compact view of filesystem status

```
# shine status -f lad
= FILESYSTEM STATUS (lad) =
TYPE  # STATUS  NODES
----  - ------  -----
MGT   1 online  nova2
MDT   1 online  nova3
OST  12 online  nova[4-5]
CLI  10 mounted nova[10-19]
```

- But highly configurable
  - Based on predefined views

```
# shine status -t ost -i 1-2  -V disk
====================== FILESYSTEM DISKS (lad) ========================
DEVICE    SERVERS DEV_SIZE TYPE INDEX  LABEL       FLAGS FSNAME STATUS
------    ------- -------- ---- -----  -----       ----- ------ ------
/dev/sde2 nova4      8.0TB OST      1  lad-OST0001       lad    online
/dev/sde3 nova4      8.0TB OST      2  lad-OST0002       lad    online
```

  - Custom format, for scripting by example
    - Extract OST nodes from configuration

```
# shine config -f lad -t ost -H -O '%nodes'
nova[4-5]
```

TUNING

- The current Lustre way to managed tunings, `lctl conf_param`, has drawbacks.
    - Difficult to list and change them
    - Tunings are lost when doing a writeconf

- Central point to define Lustre tuning: in a simple config file.
- Shine can tune /proc values according to a configuration file, depending on:
    - Node name
    - Node type (MGS, MDS, OSS, CLT)

```
####  ALIAS DECLARATION ####

alias debug=/proc/sys/lnet/debug
alias max_rpcs_in_flight=/proc/fs/lustre/osc/*${ost}*/max_rpcs_in_flight
alias max_dirty_mb=/proc/fs/lustre/osc/*${ost}*/max_dirty_mb
alias statahead_max=/proc/fs/lustre/llite/*/statahead_max

#### TUNING PARAMETERS ####

"0"   debug                     CLT;OSS;MDS;nova[120-137]
"32"  max_rpcs_in_flight        CLT
"64"  max_dirty_mb              CLT
"0"   statahead_max             CLT
```

UPDATE

Updating an existing filesystem could be tricky

- Shine detects filesystem configuration changes and proposes the command to be run.
- If you want to add a new OST by example:
  - Update your model file

```
ost: node=nova6 dev=/dev/mapper/lun[1-5]
```

  - Run update command:

```
# shine update -m /etc/shine/models/lad.lmf
Using Lustre model file ./lad.lmf
FILESYSTEM CHANGES
     Format: 6 component(s) on nova6
      Start: 6 component(s) on nova6
Update `lad': do you want to continue? (y)es/(N)o: y
Updating file system configuration file `lad.xmf' on nova6
NEXT ACTIONS (should be done manually)
>You can now `format' 6 new target(s)
>  shine format -f myfs -l lad-OST[0030-0035]
>You can now `start' 6 new component(s)
>  shine start -f myfs -l lad-OST[0030-0035]
Update is finished.
```

  - Check output and run the proposed commands

AND MORE

Lots of other features not detailed here

- Multirail: Multiple NIDs per server
- Routers start, stop and status
- Tunefs
- Eviction detections
- External journal device
- Quota
- Client-only or MGS-only filesystems
- Default striping
- Format options
- Mount options
- Mount path

- And more...

PERFORMANCE & SCALABILITY

Designed for small to very large systems

- Configuration files are kept simple
  - Even with lots of OSTs: 3 OSS in failover with a third of 48 OSTs each.

```
ost: node=nova4 ha_node=nova5 ha_node=nova6 dev=/dev/mapper/lun[1-48/3] index=[0-15]
ost: node=nova5 ha_node=nova6 ha_node=nova4 dev=/dev/mapper/lun[2-48/3] index=[16-31]
ost: node=nova6 ha_node=nova4 ha_node=nova5 dev=/dev/mapper/lun[3-48/3] index=[32-47]
```

  - Or thousands of clients

```
client: node=nova[1000-3500] mount_path=/mnt/fs1
client: node=nova[5000-6500] mount_path=/mnt/fs2
```

- Shine is running a lot of Lustre commands in parallel.
  - ClusterShell is used for that and it has already shown very good performances.
    - `http://clustershell.sf.net/` (OLS 2012 paper)
  - Few numbers (from TERA-100):

- Checking status of ~800 OSTs, on ~50 OSS:	2 sec
- Checking status of ~450 servers:	2.2 sec
- Checking status of ~3600 busy clients:	50 sec
- 11 PB filesystem, on ~800 OSTs, fsck'd in:	45 min

FUTURE RELEASES

Next releases will be focused on...

- Parallelism
  - Filesystems will be managed in parallel
- Lustre modules loading and unloading
- Health check
- Tuning
  - Better error handling
  - Applied more efficiently
- Failover
  - Automatic detection of migrated targets

Thank you!
Questions?