Storage and Data

Scientific Computing @UiB

Agenda

https://hpc.uib.no

- Storage services
- Usage
- Policies
- Lustre basics
- Performance

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Available storages on Hexagon

/home	-	$HOME
/work	-	SCRATCH
/shared	-	PROJECTS

/home file system

Generic information

- 5.5TB storage space
- 20GB default quota per user
- available only on login nodes

Usage:

- personal files (not private)
- scripts
- keys
- sources
- files for which backup is needed

/work file system

Generic information

- 175TB storage space
- parallel high performance Lustre file system
- available on both login- and compute nodes

Usage:

- main storage during data processing
- subject to automatic clean-up
- final results must be copied out
- no backup

/shared file system

Generic information

- 217TB storage space (soon to be extended with ~90TB)
- parallel high performance Lustre file system
- available on both login- and compute nodes
- 10TB group quota

Usage:

- project area
- sharing data between users and/or projects
- input files
- storage during data processing
- no backup

Data handling and storage policy

All data accessed, stored, communicated or transferred on UiB's HPC systems (e.g. Hexagon), must be handled in compliance to legal and regulatory requirements.

http://www.uib.no/it/77597/ikt-reglement-uib

Data handling and storage policy

/home

- not a shared area
- all data stored in $HOME has to be treated as being private
- directory permissions are set to mode 0700
- periodically controlled and adjusted

Data handling and storage policy

/work

- may be shared by user
- directory permissions are set to mode 0700
- access is at user's sole discretion
- automatic deletion
- no backup

Deletion

- starts when file system usage is above 70%
- oldest files will be deleted first
- newest files which can be deleted are older then 21 days

Data handling and storage policy

/shared

- private to the project
- shared between the project members
- project leader has sole discretion over project members
- permissions set to 2770 to set the global group ID
- group ownerships reset
- 10TB quota
- no backup
- no deletion

Data handling and storage policy

Overview

	/home	/work	/shared
Available on login nodes	Y	Y	Y
Available on compute nodes	N	Y	Y
Automatic deletion	N	Y	N
Backup	Y	N	N
Group enforcement	N	N	Y
Mode enforcement	Y	N	N
Performance	III	I	II
Quota	Y	N	Y

Lustre

Basics

- open-source
- parallel file system
- scalable
  - I/O throughput
  - capacity
  - 100k clients
- supports high-performance networks
- serving the most powerful super-computers in the world

Lustre

Features

- performance
- object base storage
- scalable
- stable
- POSIX compatible
- user, group and project* quotas
- RDMA

*not available on Hexagon

Lustre

Basics

Good for:

- large files
- sequential throughput
- parallel applications writing to different parts of file

Not good for:

- lots of small files
- high number of meta-data requests (i.e. stat())

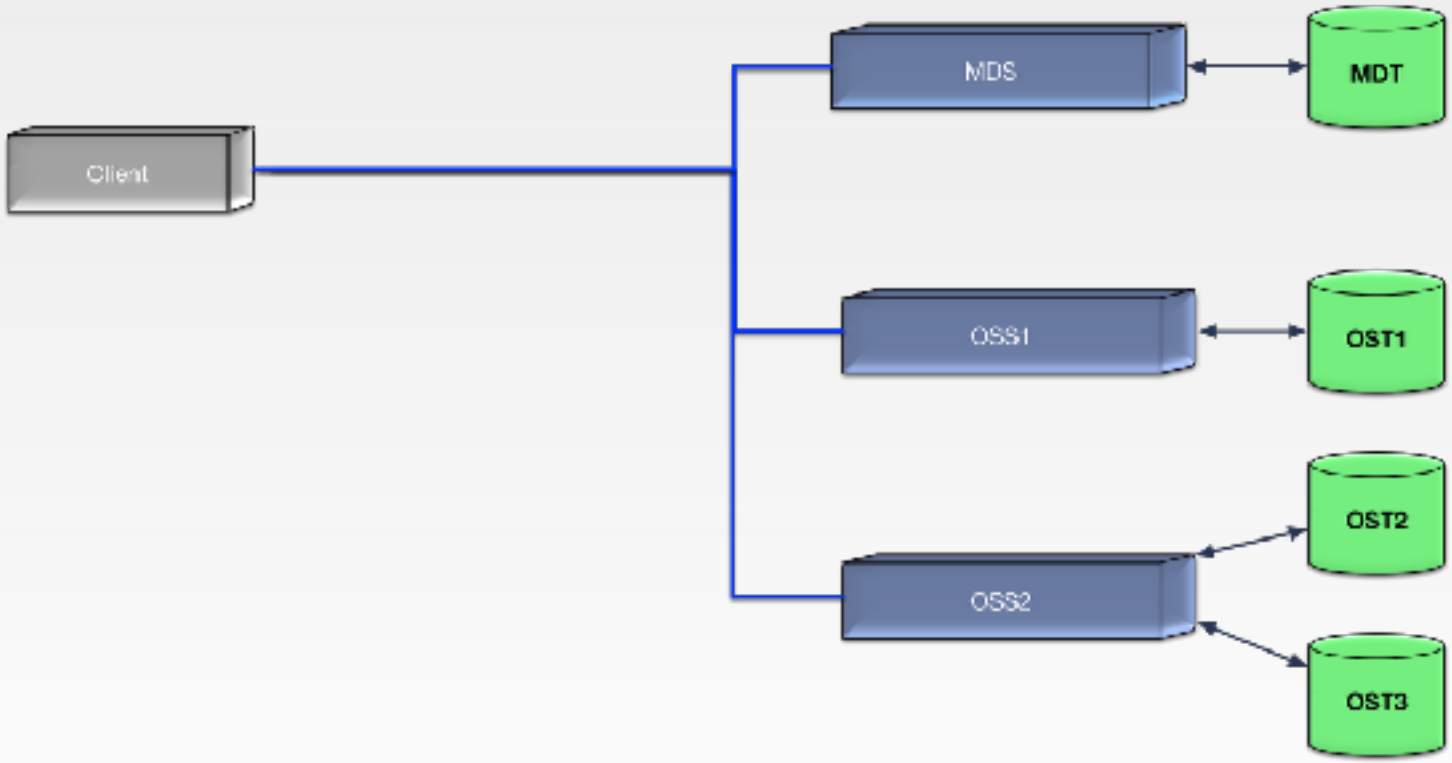
Lustre

Naming

- MDS - Meta-data Server
  - MDT - Meta-data Target
- OSS - Object Storage Server
  - OST - Object Storage Target

Lustre

Diagram



Lustre

Striping

- set striping for new file or directory

```
lfs setstripe -c 2 new_file
```

- assign file to specific OST

```
lfs setstripe -c 1 --index 1 new_file
```

- get striping for a file

```
lfs getstripe my_file
lmm_stripe_count:   2
lmm_stripe_size:    1048576
lmm_pattern:        1
lmm_layout_gen:     0
lmm_stripe_offset:  9
        obdidx         objid        objid          group
             9        122006       0x1dc96        0
             7        122006       0x1dc96        0
```

Lustre

Striping

Default stripe counts and sizes:

- /work 2 1M
- /shared 1 1M

Number of OSSes and OSTs:

- /work 6 12
- /shared 6 (9) 6 (9)

Lustre

Striping

```
hexagon-4> lfs df /work
UUID                   1K-blocks        Used   Available Use% Mounted on
bergen-MDT0000_UUID    438584324     1379684   407960224   0% /work[MDT:0]
bergen-OST0000_UUID  15614268268  3612643624 11220464516  24% /work[OST:0]
bergen-OST0001_UUID  15614268268  2479085728 12354028284  17% /work[OST:1]
bergen-OST0002_UUID  15614268268  3143063288 11690053244  21% /work[OST:2]
bergen-OST0003_UUID  15614268268  1849733268 12983382308  12% /work[OST:3]
bergen-OST0004_UUID  15614268268  2928858204 11904255136  20% /work[OST:4]
bergen-OST0005_UUID  15614268268  2686063596 12147044764  18% /work[OST:5]
bergen-OST0006_UUID  15614268268  3069261116 11763849648  21% /work[OST:6]
bergen-OST0007_UUID  15614268268  3004054760 11829055652  20% /work[OST:7]
bergen-OST0008_UUID  15614268268  2556402700 12276707356  17% /work[OST:8]
bergen-OST0009_UUID  15614268268  2590198964 12242906408  17% /work[OST:9]
bergen-OST000a_UUID  15614268268  2145642356 12687475804  14% /work[OST:10]
bergen-OST000b_UUID  15614268268  2449161200 12383957936  17% /work[OST:11]
```

Questions?

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