

# **HPC**

## **Assignment 1**

### **Case Study of Lustre File System**

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# Introduction

## Lustre File System

- The Lustre® file system is an open-source, parallel file system that supports many requirements of leadership class HPC simulation environments
- The Lustre Storage Architecture is used for many different kinds of clusters. It is best known for powering many of the largest HPC clusters worldwide, with tens and thousands of client systems, petabytes (PiB) of storage and hundreds of GB/s of I/O throughput
- The ability of a Lustre file system to scale capacity and performance for any need reduces the need to deploy many separate file systems, such as one for each compute cluster



# Features

## Lustre File System

- **Performance-enhanced ext4 file system:** The Lustre file system uses an improved version of the ext4 journaling file system to store data and metadata
- **POSIX standard compliance:** The full POSIX test suite passes in an identical manner to a local ext4 file system, with limited exceptions on Lustre clients
- **Interoperability:** The Lustre file system runs on a variety of CPU architectures and mixed-endian clusters and is interoperable between successive major Lustre software releases
- **Security:** By default TCP connections are only allowed from privileged ports. UNIX group membership is verified on the MDS



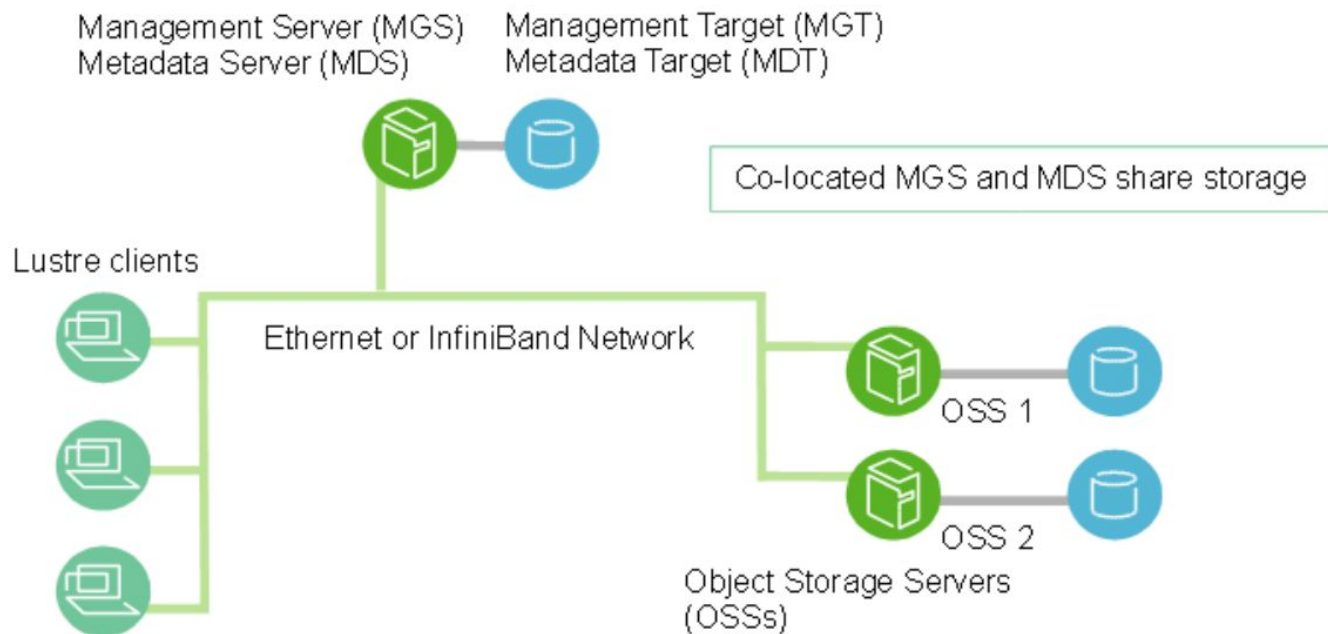
# Features

## Lustre File System

- **Byte-granular file and fine-grained metadata locking:** Many clients can read and modify the same file or directory concurrently
- **Data striping:** The Lustre file system divides a file into different segments, which logically is one file
- **Network data integrity protection:** A checksum of all data sent from the client to the OSS protects against corruption during data transfer
- **Disaster recovery tool:** The Lustre file system provides an online distributed file system check (LFSCK) that can restore consistency between storage components in case of a major file system error

# Architecture

## Lustre File System





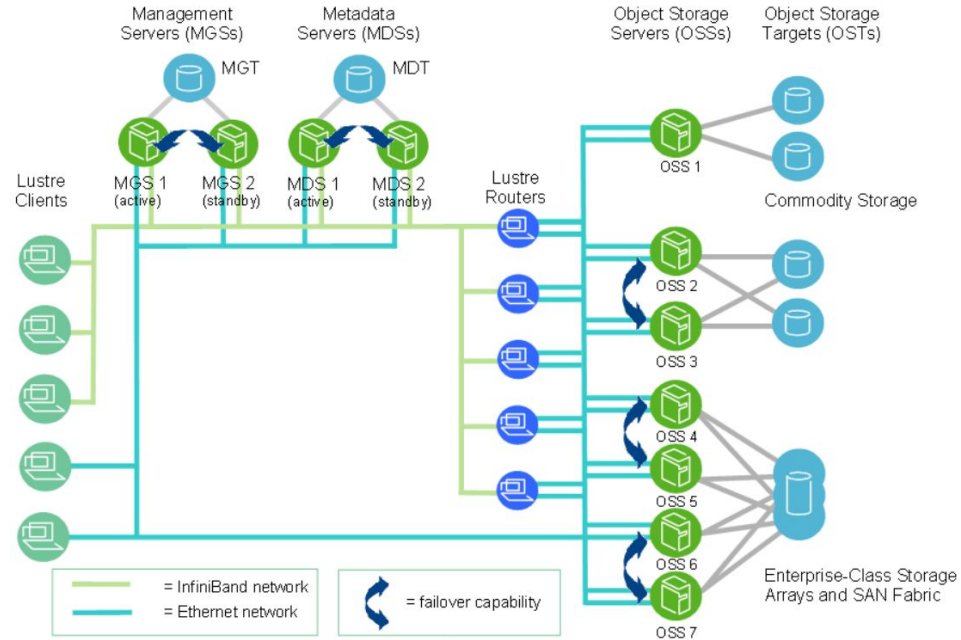
# Architecture

## Lustre File System

- **Metadata Servers (MDS):** The Metadata server is responsible for storing metadata inside the Metadata Target (MDT) available to Lustre Clients. It manages and handles names of directories, and provides network request handling for one or more MDT.
- **Metadata Target (MDT):** Each file system has at least one MDT, which is responsible for holding the root directory.
- **Object Storage Servers (OSS):** The OSS provides file I/O service and network request handling for one or more local OSTs.
- **Object Storage Target (OST):** User file data is stored inside OST.
- **Lustre Client:** They are the desktop nodes that are running the Lustre client software, allowing them to mount the Lustre file system.

# The Lustre Cluster

## Lustre File System





# References

1. <https://www.lustre.org>
2. [https://doc.lustre.org/lustre\\_manual.pdf](https://doc.lustre.org/lustre_manual.pdf)



# Thank You!

Any questions?