Luster A Scalable Architecture File System: A Research Implementation on Active Storage Array Framework with Luster file System.

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***Abstract*- File System is Data-Structure with Logic (method) to handle efficiently a group of information on disk. File systems come are classified according to their structure method of operation, speed of operation, scalability and flexibility size and security. A file system framework is an intends to sort out data anticipated that would be retained after a program terminates by giving methodology to store, retrieve and update information, and also deal with the accessible space on the device(s) which contain it. A file system framework sorts out information in a proficient way and is tuned to the particular attributes of the device. Individual device partitions can be setup utilizing one of the wide ranges of file systems. Each has its own particular features, impediments, and unique characteristics. This paper concentrates on the components of versatile and adaptable parallel file system framework named Lustre.**

A null hypothesis work has been presented on Luster file system which is a step in HPC(high performance computing). The hypothesis accepts research scope from survey of articles from various portals and presents in better approach developed by our team in research domain of file system to handle issues and built a better scalable file system like luster.

A sequential survey analysis has been done on file system for articles from last three decades in File system research .the research scope unwrapped by scholars is been highlighted in this article and implementation work of innovative scalable file system is been presents which solves many research Questions and space in file system research domain. Performance evaluation helps in assisting File system in current scenario. A systematic literature survey has been incorporated in manuscript for finding research directions. Twenty research articles have ben breakdown in abstract methodology and research scope to find in challenges and subsequent methods to overcome those challenges.

Keywords— file system, adaptive partitioning, distributed storage, parallel file system, scalable ,File system(FS)

I. INTRODUCTION

File System is Function with data-structure that an operating system uses to track files on drive, method to structure files on disk with functionality to retrieve them with easily and faster search mechanism. [5]. If a file system is not present information in storage area would be above large data where its hard to tell which segment represents which informantaion.file System(FS) differ in structure and logic with parameters differing them are speed ,security and Flexibility and capacity(size) and Their specific application design principle. FS are been used in everywhere its relates to memory being created implicitly or explicitly. Hard drives in mainframes use file system to read and write operation easily. RAM at time creates virtual file system for newly connected devices. Many FS are used on local information storage devices [5].and some facilitate aces to file via network proprieties (NFS SMB).virtual FS perform mapping into new Fs for backup data and manage metadata and file contents.

Storage Space reliability efficiency and fine tunening up with hardware or physical storage are its architecture and Design considerations.

Latest network oriented computational environment needs high execution, network oriented file framework which can fulfill information repository and knowledge sharing necessities of individual system also as groups of agreeable framework (clusters). The Lustre record framework is an open source document framework. It is General Public Licensed (GNU) developed by Sun Microsystems Inc.[2]Lustre overcomes the execution, scope and extensibility issues in numerous conventional distributed records (file) framework. Lustre is profoundly major storage architecture that consolidates build, publicly available and inventive protocols into definitive, network neural information stockpile and ease of access solution. Lustre gives high point I/O turnout in bunch of agreeable framework and utilize-information situations furthermore gives freedom from the position of information on the actual storage, safeguard from key point failure, and immediate retrieval from cluster i.e. agreeable framework reconfiguration and host or system blackouts.

As a result of the to a great degree extensible structure of the Lustre document framework, Lustre systems are prominent in logical supercomputing, and moreover in the fabricating, gas and oil, finance industry and rich media. Users of Lustre have

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advantage of the interface of POSIX with simultaneous access abilities to mutual record objects.[14]

In short Contribution of this manuscript is:

- ❖ It presents what is File System and its Functionality.
- ❖ Memory management and Storage Space Reliability and Background of File System
- ❖ Research Scope and research Analysis.
- ❖ Techniques and Scalable file System :Luster
- ❖ Future Research scope and Development in luster.
- ❖ A detailed research Implementation at Ph.d work and ongoing projects.

A. Backgroud: File System

Files system is Method to handle memory storage, create effective storage space and manages linkup with hardware storage. Space management, filename, Directories ,metadata, Access method types of file system and design limitations build the background of File system.

1. **Space Management**: The main job of FS is organization of files on disk and create directories keep Meta information while file has got which memory section. Sector →Track mapping is technique used in Space management. Slack space management is challenge which comes in scenario of Space management, where FS allocates a regular 256Kb of space for every file .using average file size computation in rune rime and allocating average size would minimize this issue.
2. **File name:** storage sectors are identified with file-name which are case sensitive and avoid mostly special character in their name.
3. **Directories:** FS have cluster group of memory segment or folders. [filename,index]-table to store all specification which might be linear and hierarchical in nature.
4. **Metadata:** length of information in file ,date and time of creation→Timestamp and user creation id ,access grants and change of information are stored in metadata which is stored separely for every file.

B. Luster: Component View On architecture

1. Lustre has three main components: Metadata Server (MDSs), Object Storage Servers (OSSs), and clients and it is an object based file framework [1].
2. Lustre applies block devices for record information and metadata storage and every block device can be overseen by one and only Lustre administration. The aggregate data limit of the Lustre file system is the total of all individual OST limits. [1]Lustre user's access and simultaneously utilize data through the standard POSIX I/O framework calls.
3. Metadata related services gives by the MDS (Metadata Servers), and Metadata Client (MDC) is a benefiter for these services. Metadata Targets are associated with one Metadata Server (MDS) per file system. Metadata for every file is stored by MDT. [2]Parameters which are stored by the Metadata are record metadata for example record name, registry hierarchy and mode of access.
4. Configuration data for Luster framework is provided by Management Server (MGS). [2]The role of Object Storage Server (OSS) is serve information and uncovered block devices. Object Storage Client (OSC) is user/client of the functions provided by framework. Single or more OSTs (Object storage Targets) are associated with OSS, and actual record data objects are hold by OSTs file System.

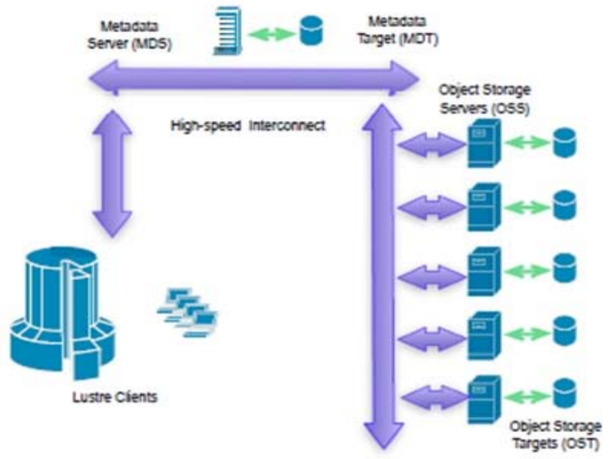

Fig1: Architecture of Luster

C.Lustre Functionality

Execution and extensibility is enhanced by Lustre by providing multiple abstractions. Lustre located files through Metadata Servers (MDS) and deals with files as objects at file system level. All record related operations are provided by MDS(Metadata Server) for example record creation, record, file searching, coordinating I/O requests for file to Object Storage Targets (OST's) and directory and file attribute manipulation.[1]Value based transactional record of file framework is hold by MDS as well as metadata changes, and agreeable system status(clusters) and recovery because of that file system's equipment and network breakdown that influence one single MDS don't influence the execution of system framework.

Like other file system frameworks, the Lustre framework has an identical i-node for each customary file, catalos, typical symbolic connection, and special file. The normal record i-nodes keeps objects references on OSTs that keep the record information rather than references to the real record information. In today's record system framework making fresh record results in to assign an i-node and establish the its fundamental attributes. Making a new record in Lustre causes results the user request a MDS, which creates i-node for record, afterward request the Object Storage Target (OSTs) for creating object which really keep the document information. Object's metadata is kept in i-node as extended attributes[1].The objects co-opted on OSTs keep the information related with record and striped over few Object Storage Targets by using RAID method. Inside of Object Storage Target, information is really pursued and writes on the OBDs. I/O between user and OSTs for recently made file is done by requesting OBDs to pursue and write information. Updating of Metadata Server is done when extra namespaces are changes connected with fresh record are needed.

Lustre conflict of real retention and assignment into Object Storage Targets and basic Object Based Disks encourages system advancement that can give extra execution enhancement in appearance of latest era of smart disk drives that will provide object based allocation information management services in equipment. Cluster based record system is effectively co-ordinate with few storage device producers to create incorporated Object Base Disk support in disk drive equipment.

This scenario is practically equivalent to the path where SCSI standard spearhead smart equipment's that transfer a significant portion of hardware communication into equipment interface and hardware controller of drive. [5]Such keen, OBD aware equipment can give instant execution upgrades to present Lustre establishment.

D. Network Independence in Lustre

Lustre is as of now being used over TCP and Quadrics (QSWNet) network systems. Myrinet, Fiber Channel, Stargen and InfiniBand support are being worked on. Lustre file system framework enables network neutrality to sudden enhancements gave by system hardware and protocol offered by new system. Lustre gives one of a kind support to heterogeneous systems. For instance, it is conceivable to associate a few clients over an Ethernet to the MDS and OST servers, and others over a QSW system, all in a solitary establishment.

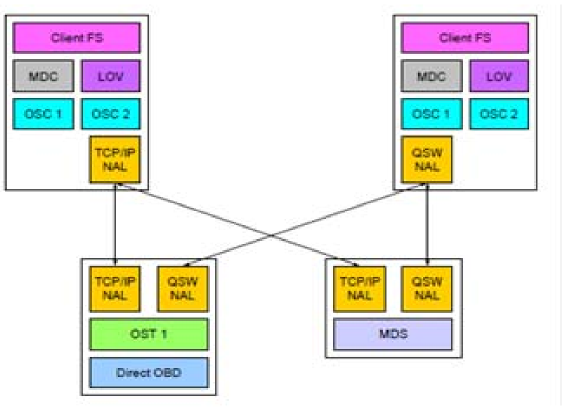

Fig2: Network independence in luster

II. Literarture Survey

A. Survey Analysis

File system fail to provide information throughput in specific application like Image processing and VLSI require large throughput, needed by applications which map file to FS in virtual space, this urges for higher bandwidth more than 512 only 2% of maxbyte Marshall and et al[12] presented a new faster file system for Unix which is re-design of Unix file system providing higher output rate and elastic allocation system for better referencing for wide processors . This FS cluster files in Two groups to increase file access rate, with Ten times more than UNIX and solves issue of **wasting large space for small files**. **Future Research is "referencing file system using remote path**". Mahadev and et al[13] presented FS for distributed environment for workstation operating on UNIX. Provides Resiliency to server and network botches with two new mechanisms "server replication: file with multiple copies to different servers. Disconnected mechanism is other facility that temporarily performs job of replication. Coda presents availability and optimized performance, first step in giving cost effective FS with scalability **.conflict resolution is major research scope to uplift performance of coda**.

Sanjay ghemawat and et.al[14]have designed GFS(Google File System) for distributed environment with information exhaustive processing ,error tolerance ,on reasonable product hardware which answers with high cumulative output to enormous clients. Author highlights need for different Design pattern and point in FS. This FS is been deployed by Google for big dataset processing and storage stand,with biggest cluster for 1000 of terabytes of data. Author presents Micro-benchmarks for evaluation. **Future scope is solving operational issues: Additional infrastructure is mandatory to keep clients from snooping with one other. Technical issue: link operating system and disks .disk supported only some IDE protocol version with error of mismatch at times causing data corruption due to kernel.(this problem is handled with checksum and kernel modification to some extend).**single reader-writer lock is additional problem detected. Centralized design of master helps in better chunk and replication. Simplified designed with application oriented rather than Posix based file system. Address same issues like luster [15] cumulative performance and no of clients request handling. Undependable components of GFS design give rise to error and faults at times. This FS uses persistent file than memory queues for use of many clients. Phillip H carns and et.al[16] Linux clusters have developed as platform for HPC(high performance computing) parallel computing for MPI(message passing interface)and networking. PVFS guarantees HPC with PVFS design and implementation with I/O Daemons and information storage with I/o call trapping methodology. PVFS results of MPI i/O, concurrent R/W for various numbers of nodes, I/O nodes and I/O request size with performance of 700 [Mbytes/sec] with Myrinet and 225 [Mbytes/sec] with fast Ethernet. **Research scope**: **TCP use for communication which is limited even on Gigabit**

network, use of ST, VIA, GM for communication would make faster communication. Abstract device interface is scope, **file-partitioning interface** to grip noncontiguous admissions reinforced in MPI-IO fits prospects of kernel lines, design new inner I/O-report format, flexible than current partitioning structure, **redundancy provision**, and **design improved scheduling algorithms** in I/O daemons in need to utilize I/O and networking assets in better manger.

Frank schmuck and et al[17]presents IBM's GPFS ,parallel FS for cluster machines on RS Sp parallel supercomputer and Linux cluster .FS design principle is distributed locking and recovery technology for huge cluster. Scalability and availability is achieved in huge cluster with token optimizations, active selection of Meta knobs for handling file metadata, segmented allocation charts, and distribution hint **Research scope:** addressability limitations is one with communication failures and disk failures are major work to done. Shvachko, and et.al[10] research article presents the motivation, architecture and overall HDFS(hadoop distributed File system) in comparison with GDFS. Google developed "map-reduce to perform information intensive processing in huge distributed Environment i.e parallel working (handling crawled web-pages, web call records, eg. Yield reversed index and statistics. Hadoop is open development of Google Map-reduce framework. Hadoop FS is core component to HDFS. **Architecture of HDFS consists** of three components **Name node**: contains name space hierarchy meta-block locations. RAM stores this information which facilitates faster processing .**DataNode**: helps to store data in local FS and is controlled by logic of Name node. **HDFS client**: source code lib which transfers interface of HDFS file System to software application. Setup pipeline architecture in between nodes to nodes and reads information from node.This three components help in flexible performance of system. Image and Journal technique: image is FS meta-info which depicts organization of information as directories and files. With backnode and checkpoint facilitate redundancy Mechanism of Hadoop. Comparative analysis is been presented on HDFS and GDFS ,HDFS is Cross platform java apache open license developed by yahoo and open community for generalized project development .whereas GDFS is C/C++ Linux and in house Google development.

Table 1 Comparison of GDFS and HDFS [10]

Execution	HDFS	GDFS
Platform	Cross-platform (Java)	Linux(C/C++)
License	Open source (Apache 2.0)	Proprietary (in-house use only)
Development	Yahoo& open community	Google
Architecture	HDFS	GDFS
Architecture Design pattern	Single Name-Node has a global view of the entire file system	Single Name-Node has a global view of the entire file system
Inter-Node Statement	Name-Node practices heartbeats to guide instructions to DataNode	Name-Node practices heartbeats to guide instructions to DataNode
Data-Node Design	User-level server method stores chunks as files in native file system.	User-level server method stores chunks as files in native file system.
FS State	HDFS	GDFS
Indexing	File index state and mapping of files to blocks kept in memory at Name-Node and periodically flushed to disk;, modification log records changes in between Checkpoints.	File index state and mapping of files to blocks kept in memory at Name-Node and periodically flushed to disk, modification log records changes in between Checkpoints.
Block Position State	Name-Node retains and insistently provisions block location info .	Name-Node retains and insistently provisions block location info
Information Reliability	Checksums verified by clients	Checksums verified by Data-Nodes
FS Operation	HDFS	GDFS
Write operation	Append only.	Random offset write, Record append.
Write Guarantees	Single-writer model guarantees files are always well-defined and dependable	Effective synchronized writes create reliable but vague regions.Record appends create distinct regions scattered within consisten
Deletion	Deleted files renamed to special Trash/Recycling Bin like folder and removed lazily by garbage gathering process	Deleted files renamed to special Trash/Recycling Bin like folder and removed lazily by garbage gathering process
Snapshot	HDFS 2 allows each index to ensure up to 65,536 snapshots	Can snapshot individual files and directories.
	128MB default but user configurable per fi	64 MB default but user configurable per file
Primary Use	production services, R&D and MapReduce jobs	production services, R&D and MapReduce jobs
Data Access Pattern	Random access reads supported but enhanced for streaming	Random access reads supported but enhanced for streaming
File Size	Optimized for Large Files	Optimized for Large Files
Replication	User configurable per file, but 3 replicas stored by default.	User configurable per file, but 3 replicas stored by default.
Client API	Custom library and command line utilities.	Custom library and command line utilities.

The blue enlighten records indicate similarity whereas read indicate dissimilar operations and functioning.

The comparative analysis reveals need Research in: **Better Platform (cross platform) with availability for general community (Open), Information reliability, and write operation and write Guarantee.** Author has presented performance benchmarks DFSIO: write and read per node, production cluster, Sort, Throughput.[3] author work presents authenticated file system designed to handle huge workload in cloud. Iris upholds a big file system in cloud. It offers architecture scalable to numerous clients achieves end-to-end throughput to 260MB/s for 100 clients supplying simultaneous requests on file system. Authenticating data-structure design optimization like sequential-file-access erasure code allowing paramount efficient dynamic PoR protocol. Scalable file system is been achieved with architecture design **Research Scope:** better mechanism to handle Network bandwidth with hard-drive throughput.[4]security is serious concern of modern file and stowage schemes, imperative to protect stored information from illegal access. Author work presents Java File Security System (JFSS) in FUSE (file in user space), encryption complexity is moderate with java and give portability but some reinforced limitations. Security has been evaluated with 3 parameters security level, ease of use and performance.**Research scope: minimize extra space acquired due to encryption of 157bytes and energy**

efficient File system.[5] author presents 80 years of survey on linux file systems in 5079 patches and provides in depth insights and bugs finding in File system. 1800 bugs have been documented and the manuscript is guide for FS developers and designers **Research Scope: new generation of more robust, reliable, and performant file systems.[6]** author presents HPC demand need highlights limitations of current algorithms. Mappers and reducers make algorithm scalable and better in time complicity. Distributed computing and parallelism is achieved. **Research scope: Java implementation would make it better, Run Filter and Read Directories alongside. HAMA for file path generation.[7]** Author describe the architecture of ZFS and its goals and how its goals are achieved. ZFS buit upon the concept of decentralized file system. Features- cooperative cache and distributed transaction. It integrates memory of all associated machines into one coherent cache.Goals- for achieve high Scalability ZFS separate file management from storage management, use of all associated machine's memory as a global cache. **Research Scope :** on integrating and managing this components as **Components- 1**.Object store(OSD)- on which store files and created. It provides file abstraction, security, safe write.**2**.File System Layout- Each directory maps single object and file also maps single object. File object saves attributes of files. **3.**Front End- It presents the API to client for access of ZFS files and directories. **4**.File manager- It contacts to lease manager for checking lease permission for file when any file operation is requested. File manager keeps track of all operations**.5**.Lease manager- Locking of file is replaced by lease manager for fault tolerance when machines are failed. **6**. Cooperative cache- retrieving data faster from remote machine than local disk. It uses all connected machines memory as single global cache. **7**.Transaction server- All directory operations are implemented as distributed transaction. Transaction server manages these all operations. It requires proper leases to perform operations.[**9**] Author describe about how storage utilization can be improved InterFS. There are many techniques suggested by researchers for resource utilization but these are not full proof. InterFS is POSIX compliant distributed file system targeted at full use of storage resource on data center cluster. **Features**- POSIX compliant interface, mixed deployment i.e. only master node require dedicated machine InterFS file server, client and other online services run in one server, efficient for huge amount of small files, file locking for maintain consistency, feasible access pattern. Each file in InterFS has multiple replicas which are stored on multiple file servers. **Working**- Client request for data to Maser, Master contacts to file servers because each replica stored in one of these servers. Block mapping metadata stores in one file server. Metadata stores 3 types of metadata i.e File namespace, access control and location information. **Research Scope:** Optimization techniques- resource isolation scheme (CPU, memory, network bandwidth, disk throughput, disk space, no of inodes), Peak load dodging scheme, region based replica placement scheme. Author evaluates Interplanting system performance with without interplanting system. Namespace operation performance, impact on levelDB performance and impact on mecached when co located with different distributed file systems.

B. Reserach Question Analysis(RAQ's)

Summarizing above research scope Statements we come up with crisp Research Question that needs to be addressed in our research Implementation .RAQ help to keep track of research in proper direction and success and failure depends on achieving methods techniques to solve them with proposed system.

***RAQ1**: **Name Space handling and optimization**: Need to have effective mechanism in file System to handle name space with better Referencing mechanism.[12].resolving conflicts to raise performance[13]*

***RAQ2**: **Technical Issues**: linkage OS and disks. Disk some IDE procedure version with error of mismatch at times causing data corruption due to kernel .java would refractor the performance to better level.[14,6].*

***RAQ3: Communication Mechanism:** better communication rather than just use of TCP.[16].*

***RAQ4: Better Architecture Design pattern:** Better Platform (cross platform) with availability for general community (Open), Information reliability, and write operation and write Guarantee.[3,14]*

***RAQ6: File I/O Operation:** file-partitioning interface to grip noncontiguous, redundancy provision, and design improved scheduling algorithms in I/O daemons in need to utilize I/O and networking assets in better manger.[14]*

***RAQ7: Security of file system:** today's environment and cloud operations urge for need of secure file system with inbuilt security mechanism[4].*

C. Future Research Scope and Dircetions in Luster:

1.) Global Namespace: Distributed file frameworks hives various authoritative points of features. [1]The key circumstances of distributed file frameworks are that they give access to significantly more storage capacity than could be physically appended to a solitary framework, and that this storage can be accessed to from any approved workstation. In any case, getting to shared storage from distinctive frameworks can be befuddling if there is no uniform method for introducing to and getting to that storage. The classic method for giving a solitary method for alluding to and getting to the documents in a distributed file system is by giving a "global; namespace". Entire distributed file system is made available for clients through a global namespace that is a single directory. This process is called as mounting distributed file system on that directory. In the AFS distributed file framework, the worldwide namespace is that the directory/afs, that provides hierarchical access to file sets on numerous servers that are mounted as sub directories somewhere below the /afs directory.AFS does not store configuration data at client side to discover target file set, when traversing file set mount points. Rather contacts a file set location server to find the server on which the file set is physically present

2.) Metadata and File I/O Performance Improvements

One of the first improvements to be introduced is the utilization of a write back cache for file creators to give higher performance. Presently, Lustre writes are writing through however, which implies that write request are not finish until the information is really flushed to the objective OSTs. In cluster groups, this can urge a accountable delay on each record write operation. The utilization of a write back cache, where file write are journaled and conferred asynchronously, gives a guarantee for significantly higher-performance in file write demands.

3.) Advanced Security

In distributed file framework key aspect is file system security.[9]The main threat about security is encryption, authentication and authorization. While Storage Area Networks (SANs) are generally unprotected, Lustre supports the OSTs with a Secure Network Attached Disk (NASD) advantage. Rather than choosing and selecting a particular authentication service, Lustre will simply be integrated with existing authentication mechanisms utilizing the Generic Security Service Application Programming Interface (GSSAPI).It is an open standard that gives supporting authentication, secure session communications, information confidentiality, and information integrity. Kerberos 5 and PKI mechanism are supported by Lustre for authentication purpose. Lustre provides Access Control Lists that pursue the POSIX ACL semantics. The flexibleness and extra capacities gave by ACLs are particularly vital in clusters that may support thousands of user accounts and nodes.

III. ALPHA INVESTIGATION AND DATA EXTRACTION

Literature survey technique plays vital role in developing research background.what article are cited and in what way they have been cited. In alpha analysis crisp survey has been done to formulate research implementation and our survey method has changed and finalized as “most citation based articles with keywords as file system, luster. Finalized key research queries have been formulated from only ten core articles and limitation of survey is “ we have not taken any citation of current blogs and portals dedicated to file system nor we have submitted our research work to any community for evaluation although the testing tools strong support our research work and we are in process to submit proposed methodology for community work they are just a missing corners which don’t affect research in any way.

A. Survey Technique

Survey has been done on most citated articles from Google scholar IEEE and ACM and International Journal

B. Query Used in Survey

File System AND Scalable File System WITH Focus on Luster work and

C. Survey Breakdown

Total survey has been done on 22 Articles with 50% IEEE papers 30% ACM Articles and 15% on journal and 5% on other web portal .The Literature Graph is as shown below

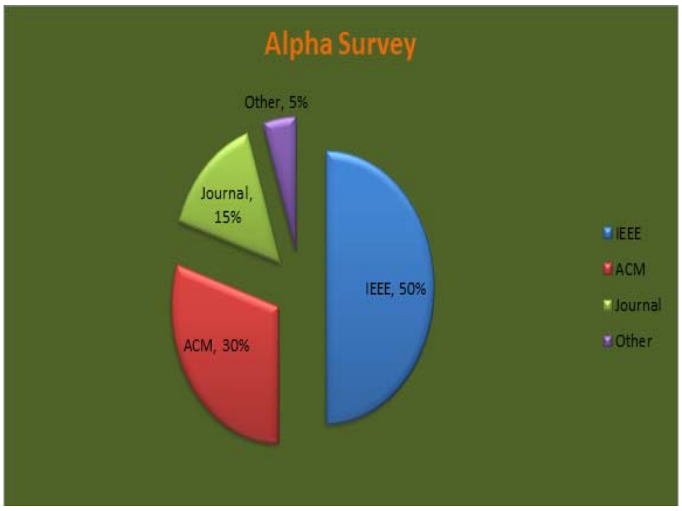

Fig 3: Alpha Survey

IV. CORE METHODOLOGY

The scalable Architecture of luster presented is below with layered design which makes its scalable over other architectural styles.[20]

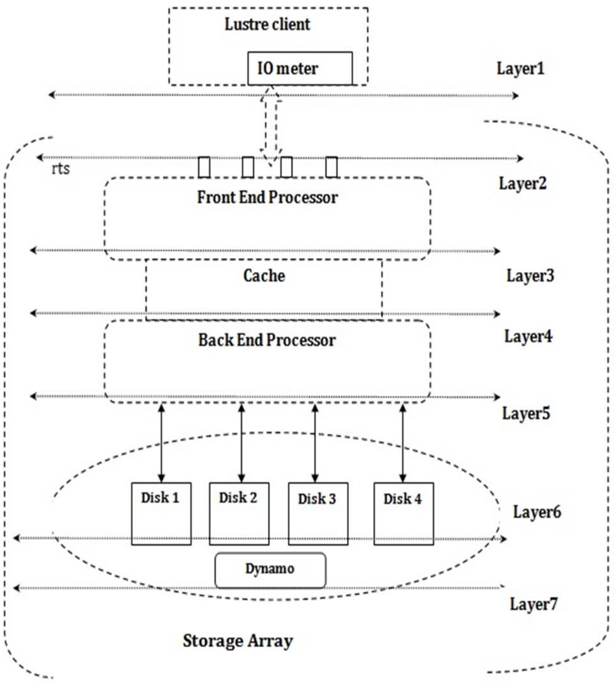

Fig 4: Architecture of proposed Luster Implementation

Luster Components:

- **I.** Components of testbed:
- **II.** Client Lustre: - Lustre File system is backbone of our testbed. Interface between Server of Lustre and Linux virtual file system is by Lustre client. This hosts the application and access the OST for required data.
- **III.** Front end processor- Front end processor is attached to ports. Main task of front end processor is serve the Lustre client request at a time. Single request can accept and acknowledge at a time by the front end processor. The more the number of processor, the more simultaneous I/O servicing happens.
- **IV.** Cache- This is the fastest memory component. Cache is responsible for serving many requests which are generated by Lustre client. Each front end processor is allocated with the fixed size of cache, allocation of cache to multiple processors is done by using cache partitioning. Some cases Cache work as single large memory component. If data requested by Lustre client is resides in cache then front end processor serve it directly from cache to client.
- **V.** Back end processor- These are interface between disks and back end processors.
- **VI.** Disks- These are actual physical storage components where data is already residing. Disks stores all the data comes from Lustre clients and served back as per Lustre client requests. These disks are configured with various RAID methods as per requirement.

Luster setup:

- **[1.]** **Step 1.** Create 4 virtual machines with n no of disk, n number of CPU's, n number of cache. Each virtual machine runs on Linux, centos or Ubuntu. Each virtual machine now has one front end processor and one back end processor. We called each virtual machine as a storage server.
- **[2.]** **Step 2**- One virtual machine acts as a MDT, one as a MDS, one as a OSS and one as a OST's. Each node has the same architectural components shown in above fig (number) i.e front end processor, cache, back end processor, and disk storage units.
- **[3.]** **Step 3**- Now our testbed is ready for evaluating the workload execution. Iometer tool is used for disk storage benchmarking. Dynamo and GUI are the components of Iometer. Create, read, write data from file is main task of Dynamo. We separate Dynamo and GUI part of IOmeter and install Dynamo on the previously configured OST's i.e storage node. This Dynamo runs inside the virtual machine at storage server.
- **[4.]** Step 4- GUI part of IOmeter runs inside the Lustre client. Lustre client runs windows, Linux, centos or Ubuntu. Dynamo is workload generator executes I/O intensive and data intensive tasks and record performance data at the storage side. This performance data is send to GUI at Lustre client side.
- **[5.]** Configuration for testbed for storage server

Table 2: Testbed in luster

Components	**Required configuration**
Processor	Latest Intel processor with 4 cores.
RAM	Minimum 4 GB.
Disk Storage	Minimum 500 GB with 7200 minimum rpm.

Table 3: Configuration for Lustre client

Components	Required configuration
Processor	Intel i7 and above.
RAM	Minimum 2GB.
Hard disk drive	160 GB and above.

V. Research Implementation

Looking at the overall scenario, the major bottleneck is network traffic and Throughput. In order to reduce the impact of these bottlenecks on client, a process has been proposed which minimizes the throughput consumptions and network traffic by executing operations on the any files where they are stored. In the Proposed system a set of operations are migrated to the node where the files are stored. These migrated operations are executed on the files and they are streamed back to the client. The working concept of the proposed system is similar to a View in Database and Remote Desktop
The operations like compression. Encoding, Decoding is executed by the application server and then these encoded/compressed files are stored in the Storage. The proposed system also suggests a way in order to migrated these operations to the storage disk or node where it can be executed. Thus deploying this proposed system will yield better efficient management, Less network traffic and high throughput.
This concept we propose for Lustre file system. To improve the performance of Lustre throughput and I/O bound, application offload at the OST's through OSS's. Application knows the target OST's and OSS's from the MDT. Then application itself offloads onto the targeted OST's. This increase the system reliability.

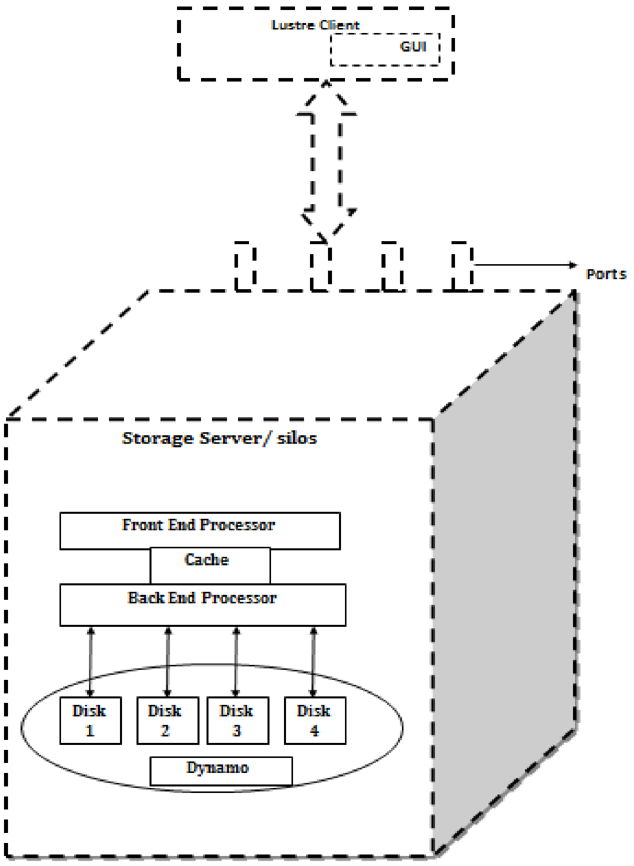

Fig 5: Block view of Luster

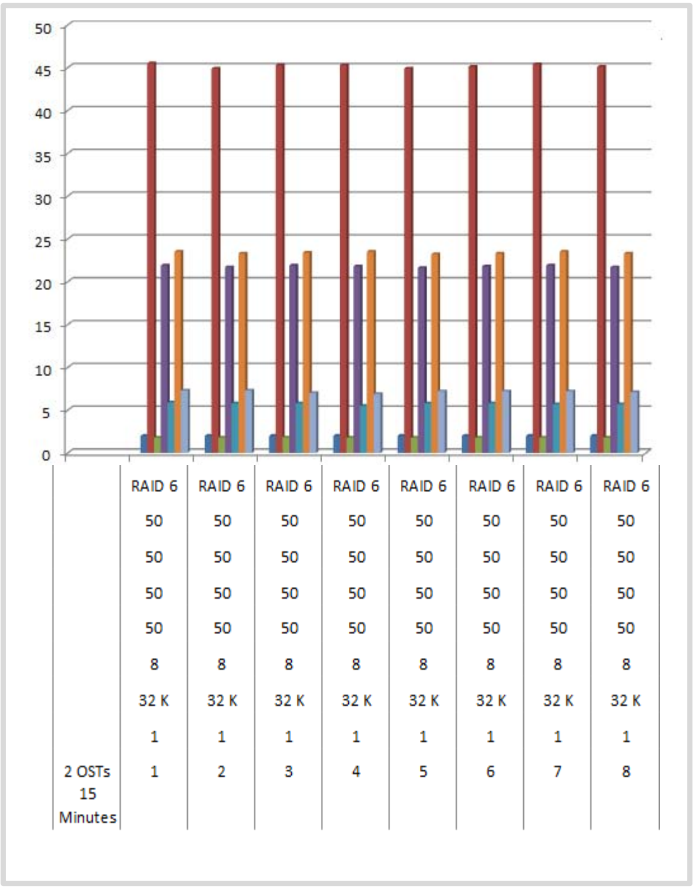

Fig 4: Graph for Evaluation of Disk 2E for Series.

A. *Minimize network burden*

Lustre used on Big Data, most of operations on Lustre are the data intensive computation. By offloading applications directly on the OST's where actual data is situated minimize the network burden. Migration of application instead of comparatively huge amount of data is more feasible.

B. *Increase throughput*

Application offloading and fetch resulted data back to the application server is less than migrate huge data to application server, process data and send reaming data out of result.

VI. Results and Evaluation

Result Evaluation has been presented for Three Evaluation classes Disk for 2E, Disk for 2C and Client Statistics with parameters as: Disk IDs, Number of Clients, File size, Number of Workers, Read %age, write %age, Sequential, Random, RAID Type, Lustre File Stripe Size, IOs/Sec, MBs/Sec, Read/Sec, Avg Read Response Time, Write/Sec, Avg Write Response Time.

The Luster Strip size is common 1MB default and File Size is by 32Kb ,32 kkb 32kb ,random factor common as 50 set.

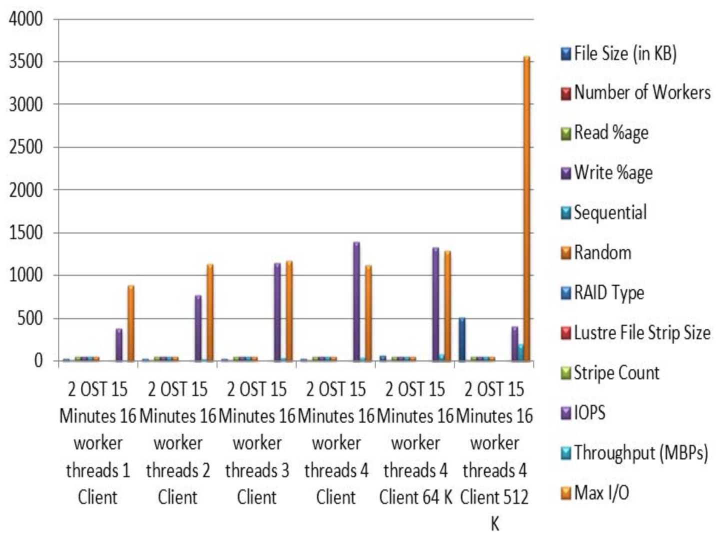

Fig 5: Graph Evaluation for Client Statics on Luster

The Line Graph of above Luster Implementation suggest that system is Scalable through change in file size and no of clients accessing with Major technique of Dynamic Threading in file system for much faster and scalable performance of system

VII. Conclusion and Future Scope

Lustre is latest storage architecture with many advantages and distributed file framework that gives scalability, higher performance and flexibility to enterprise networks, computing clusters and shared data in network oriented computing environments. Lustre utilizes an object storage model for file I/O. File system changes and transactional record of high level file are maintained by Metadata Servers (MDSs).

Dispersed Object Storage Targets (OSTs) are in charge of real file framework I/O and for interfacing with neighborhood or network storage devices known as Object-Based Disks (OBDs). Lustre is an open standard, for example, Linux, XML, LDAP, SNMP and can be easily accessible from open source libraries, and existing file system frameworks to give a reliable, powerful and scalable file system framework. To wipe out downtime and to boost file system's accessibility Lustre uses replication, sophisticated, cutting edge failover recovery methods. In this way Lustre achieves higher performance and productivity. Inventors of Lustre are effectively actively working with hardware producers to help to invent coming era of smart storage devices, where hardware enhancements can further offload data handling from the software segments of a distributed file framework to the storage device themselves. The file system has further implementation in search project like search engine of next generation [8][21][23][24]as complete scalable system is achievable with this file System as core .

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