International Journal of Applied Engineering Research
ISSN 0973-4562 Volume 10, Number 12 (2015) pp. 32141-32150

http://www.ripublication.com

An Enhanced Storage Management Scheme with Search Optimization for Cloud Data Center

Rajesh Bose[1] Sudipta Sahana*[2] Debabrata Sarddar[3]

Ph.D. Scholar, Department of Computer Science and Engineering,
University of Kalyani, West Bengal, India
bose.raj00028@gmail.com
Assistant Professor, Department of CSE,JIS College of Engineering
Kalyani, Nadia, W.B. India
** corresponding author ss.jisce@gmail.com*
Department of Computer Science and Engineering
University of Kalyani, Nadia, West Bengal, India
dsarddar@rediffmail.com

Abstract

Cloud storage is an emergent technology which is widely used nowadays although there are some certain restrictions. There are many applications such as software for processing customer records in consumed electricity, employee records in MNCs, accessing a single email from a mailbox etc. which involves retrieving a single data from a database consisting of millions of records. Elementary features of these applications are to access data sets which are very large but simple. Cloud computing offers computing necessities for these classes of new generation of applications containing very large data sets which cannot perhaps be handled efficiently using traditional computing infrastructure. In this paper we have proposed an enhanced storage management scheme which helps client to store their data according to their desire place based on their accessing policy. A smooth search optimization technique has been introduced here that helps in finding data quickly in cloud data center. Based on access policy the memory has been categorized in three segments for quick access of data searching for. Energy requirement in this proposed approach is also less because of only the possible segment is accessed instead of the entire memory, so this approach takes a special care on less carbon emission generated by the cloud data center.

Keywords – Cloud Storage, Data Center, Search Optimization, Energy, Carbon Emission.

I. Introduction

Cloudcomputing has been intended as the next generationplanning of IT industry, due to its long list ofunparalleled compensations in the IT history: On-demand self-service, universal network access, location independentresource assembling, faster resource elasticity, pay per usage and transference of hazard. As a developing technology withinsightful consequences, Cloud computing is renovating thenature of business practice information technology field. Oneimportant aspect of this paradigm shifting is that resource isbeing centralized or consolidated into the cloud in a stretchy on demand fashion that brings attractive benefits: release of the loadfor resource administration, widespread data access withindependent geographical locations, and escaping of principalexpenses on hardware, software, and staffing management etc. while Cloud Computing gains more appealing than ever, it also carries new andstimulating safety threats towards customers' outsourced data.One of the major concerns with cloud data storage is data reliability verification at untrusted servers.

Cloud storage offers an upright opportunity for technical revolution in this era of information bang. In accumulation to the initial adopters from the e-commerce, enterprises, organizations, and individuals initiate to depend on cloud to store their digital statistics. The diversity of data and access increases fairly a few challenges for the administration and conservation of cloud storage systems, such as rate, consistency, accessibility, responsiveness etc. while cloud storage architecture are intended for enormous data storage, the continuous growth in measure makes it tougher to solve all these difficulties efficiently.

Cloud computing is a system that provides resource storage and access, through clustering technique, grid computing or distributed file system and other purposes, gather a large diversity of storage devices in network using the application software and work together. Cloud storage is projected to provide elastic storage facility based on data center over the internet. So that the consumer can get rid of the limitless data relocation and enjoy the accessible and boundless storage everywhere, at any time via internet. Most of these clouds storage, which are distinct purpose storage systems in nature, are accessed by keen applications and facilities, such as data archiving and large data handling. In view with traditional storage devices, cloud storage not only hardware, but a multifaceted system that comprise of network device, storage sector, server, application software, public access interface, access network client program and so on. In terms of performance, cloud storage plays an important role on data security, reliability, and efficiency. With a larger number of customers, a broader service range, and a composite ever-changing network environment, cloud storage schemes face greater practical challenges than traditional systems when providing high-quality facilities. In terms of resource management, cloud storage systems not only offer to access files, but also give provision in mass storage management for facilitating public service support utilities, and maintaining data in the background.

The rest of the paper is organized as follows. Section II describes related work of this paper. In section III we have discussed our proposed methodology. Section IV describes the implementation of our algorithm, and demonstrates execution efficiency. Section VI concludes with a summary and possible future works.

II. Related Work

In this section we have presented a brief literature survey of existing research methodologies. J. Sun et al. in [1] present the architectural model of cloud storage system is recorded, comprising access layer, application interface layer, basic management, and physical storage layer. There are numerous well-known cloud storage service providers in the world, for example, Dropbox, Google Drive, Box.net. The benefactors offer cloud storage services on public cloud system. Many industries choose public cloud storage because of its assurance of better productivity and lesser charges. Safety concerns yet cause reluctance for administrations making the shift. Therefore, cloud storage facilities based on private cloud system are increasing. Though private cloud is safe, the service disposal is still inadequate.

Ever more researches have been aimed on the amalgamation of private cloud and cloud storage service [2]. Wu et al. in [3] presented the setup of cloud storage and to hide the difficulty of IT organization from its consumers. Besides, the two investigates give the rapid summary of cloud storage for the scalability, consistency, extraordinary performance, and specifiable configurability. Several researches in the application domain of cloud storage are discussed and applied in [8][9][10]. In order to resolve the safety concern of cloud storage provision, there are plentiful methodologies in the arena. To retain the security in public cloud would charge more to prepare some program design frameworks or hardware facilities.

Koletka, et al. in [6] proposed the design to permit consumers to securely store data on a public cloud, while also approving for search ability through the user's encrypted data. L. Hao in [7] proposed the parallel approach in private cloud architecture.

Zhang et al. in [4] gives a comparison between private cloud storage and traditional storage model, explores the benefit and feasibility of private cloud storage expertise, and presents bulk data storage and stretchy extension approaches based on Hadoop. The projected storage system demonstrates the enterprise private cloud storage environment is fit for complex business applications and procedures. Zhang, et al. used Service Level Agreement (SLA)[5] as the collective standard between consumer and benefactor to certify data security in cloud storage system.

Liu et al. in [11] discusses some cloud computing systems and examines cloud computing safety concern according to the cloud computing perceptions and services. The above investigates highlight the security issue along with the advantage of private cloud storage system.

Data retrieval query should be automatically routed to the duplicated copy across the remaining data centers in case of a whole data center suffering from a network connectivity concern or outages. In this fashion, we can regain important data from the cloud as rapidly as it is desired. Therefore ease of use assurance of cloud service is a serious and challenging concern. For assessing the disposal of the systems a component-based accessibility modeling framework is presented to constitute a comprehensive accessibility model for cloud services [12]. In [13] the author address the elasticity of data usage, research focuses on programmed administration of cloud resources. Widjajarto, et al. proposed the expansion of cloud computing reference model [14] for on demand services, based on both application characteristics and

resources availability. The purpose of the researches is to minimize idle resources in cloud architecture.

Jayasinghe et al. proposed a structural constraint-aware virtual machine placement [15] as an effective way to improve the performance and availability of services presented on cloud services. However, none of them discussed how to retrieve resources from public cloud to attain the high availability of private cloud.

Debabrata et al. in [16] focused on resourceful load balancing coupled with a technique which reduces flooding and discussed how a combination of these is able to ensure efficient routing with reduced carbon emission. Our methodology is somehow related to storage load balancing also.

III. Methodology

We have introduced a layering structure in storage for easy access, better search optimization and reduce power consumption. Accessing the storage frequently for a resource finding consume more power. For proper utilization of energy we have categorized the total storage into three parts based on accessibility. The cloud user can save their data for various purposes; some of the data is used frequently in a day or once a week or once a month. Based on this scenario we have divided it into high access, medium access and low access segment. The file can be saved by users choice and it will be shifted from one segment to another automatically based on user access. Each segment contains a supervisor which keeps a summary table with resource accessing rate about the storage resource. Summary table includes resource id(generated by the storage segment), resource title, resource key elements, resource access rate.

Resource StorageAlgorithm

Step 1: Client sends a req_msg regarding storage query to the server.
Step 2: Server reply back with required information.
Step 3: Client sends a res_msg containing title, key elements, volume, and access type for the data to be stored.
Step 4: Server checks the mentioned access type and forwards it to the exact segment supervisor and a notification is sent to the client for data transmission.
Step 5: Supervisor copy the title and key element in summary table and store the data sent by the client in the storage database.

Storage Managing –

The supervisor has a major role in monitoring the resource as well as auto shifting the same in different segment. If a resource is in high access segment but is not accessed for a long period of time then it is shifted from high to medium and from medium to low, the vice versa is also true i.e. if any resource is in low access segment but frequently accessed then it is shifted from low to medium and medium to high accessed segment according to the access rate table.

Table 1: Access Rate Table

Segment	Access Rate
High Access	Access once in 5days
Medium Access	Access greater than five days and less equal 15 days
Low Access	No access more than 15 days

***Access rate table*:**
In this proposed work we have tried to utilize the storage in a proper way for better search optimization and reduce power consumption. For this reason we have segmented the storage according the following table which is followed by the segment supervisor also.

Resource Accessing:
When the client wants to access its saved resource first it sends a request to the cloud server. The sever sends the same to all the supervisors. Supervisor having the data revert back with resource.

Resource Accessing Algorithm
Step 1: Client sends access requestto the serverfor the stored resource.
Step 2: Server forwards the same to the three supervisors.
Step 3: Supervisors match the request with the summary table.
Step 4: Response reverts back by the supervisor holding the resource.
Step 5: Supervisor updates the access rate table.

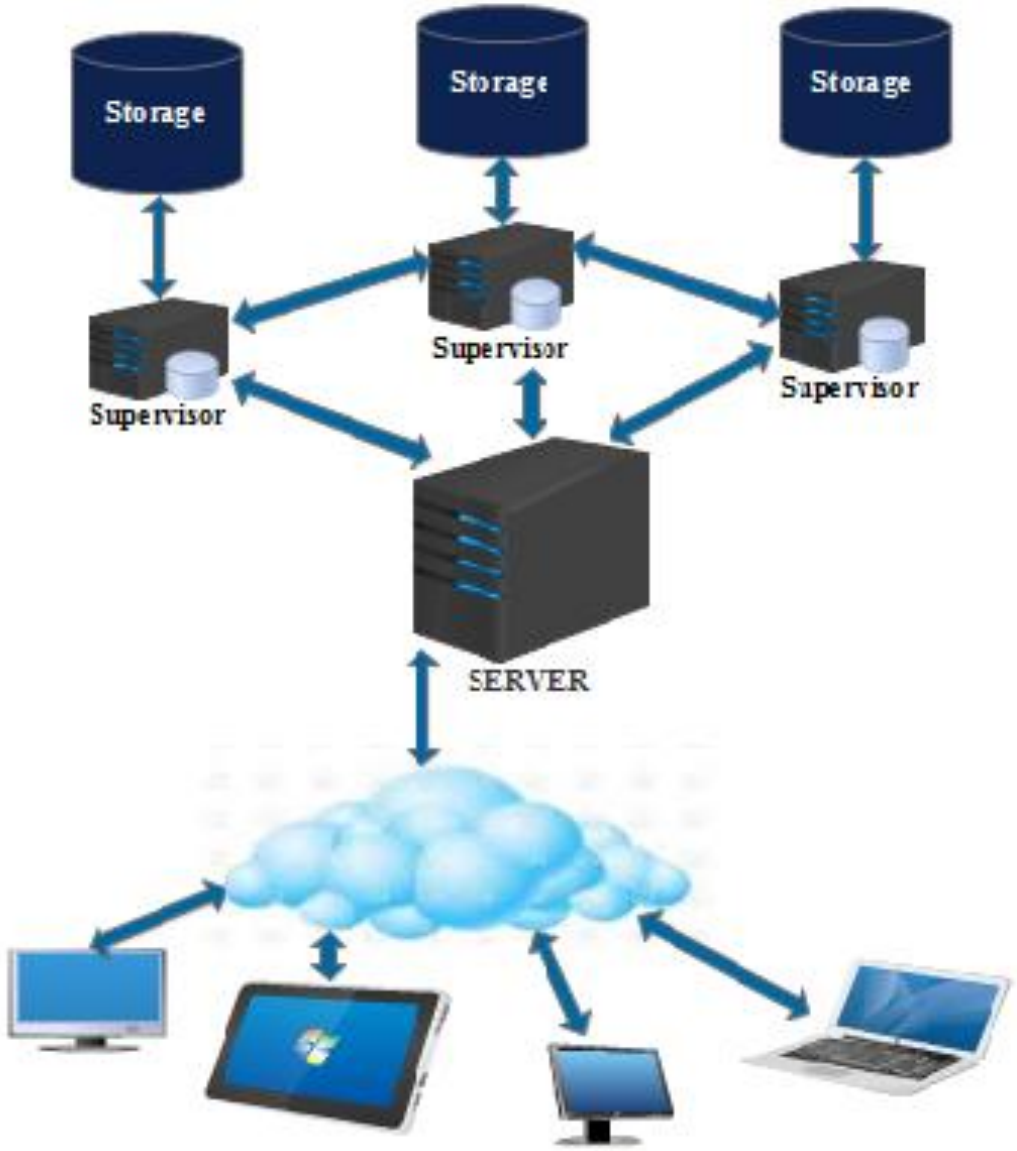

Fig. 1 – Block diagram of our proposed model

V. Result Analysis and Discussion

For better search optimization policy in this paper we have introduced storage segmentation policy. According to brief research in this domain we have seen most of the authors concentrate on storage security policy without considering storage structure. Storage layering concept has a major role in reducing access time and less carbon emission.

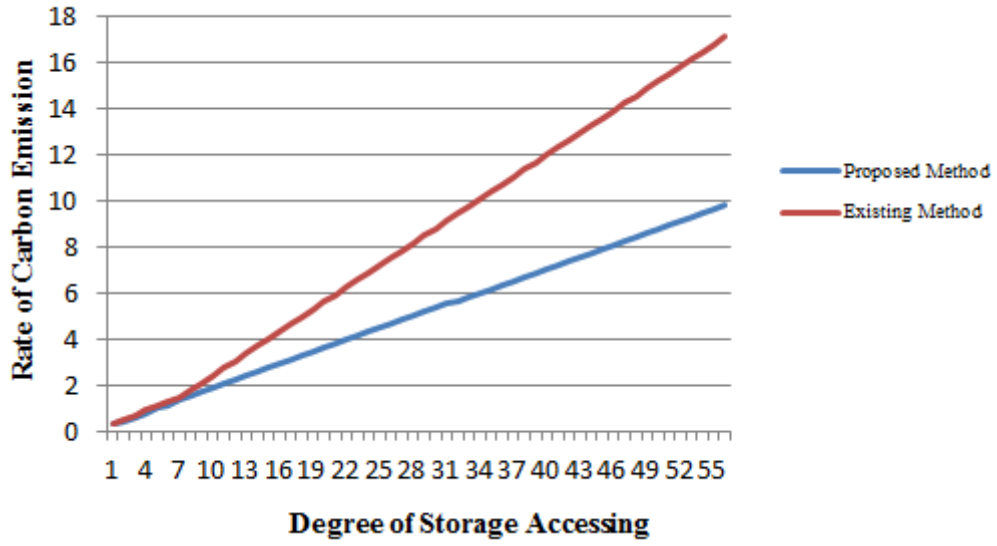

Fig. 1- Rate of Carbon Emission vs. Storage Accessing Rate

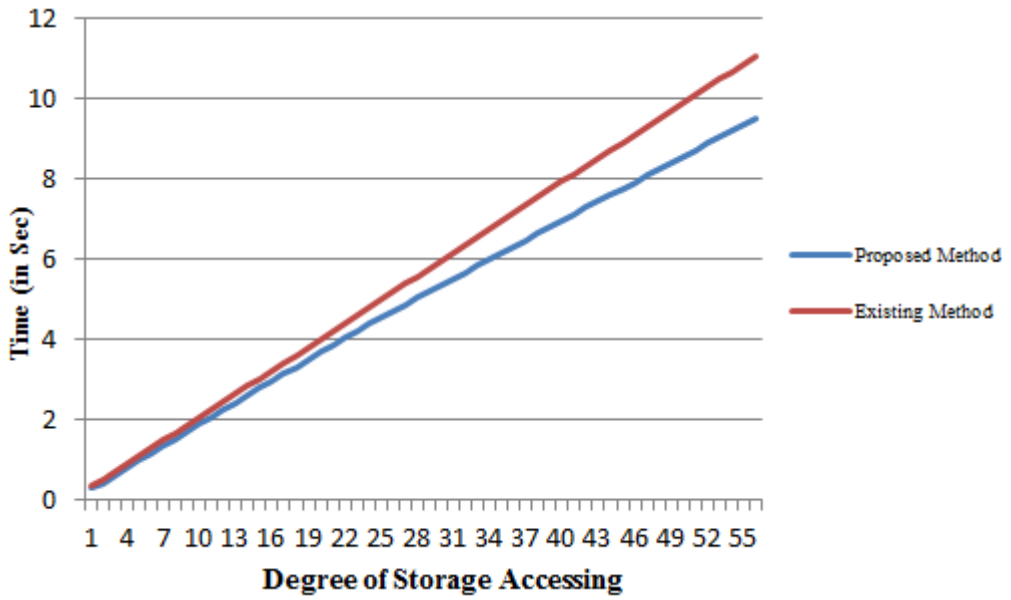

Fig. 1- Required Time vs. Storage Accessing Rate

According to the result analysis we have seen that our proposed methodology takes less time as well as the rate carbon emission is also less than other existing methodology.

V. Conclusion

Research in various issues in cloud storage is an emerging trend. In this paper we have introduced a storage layering concept depending upon the access of the storage. For searching a file, the entire storage is not accessed which helps in searching the resource in a faster and efficient manner. Entire storage access also consumed more energy rather than specific segment of storage. Automatic resource shifting of long time unused data from one segment to another also reduces the overhead of the storage segment that is accessed frequently. Accessing entire memory repeatedly generates heat as well as emits carbon which reduces the hardware life. This paper addresses the issues using storage segmentation which reduce carbon emission and provide a step towards green cloud computing. Secure access in a distributed cloud storage system is a significant direction for future research.

REFERENCES

1. J. Sun and S.-S Yue, "The Application of Cloud Storage Technology in SMEs," Proc. International Conference on E -Business and E – Government (ICEE 11), IEEE Press, May 2011, pp. 1-5.
2. J. Deng, J. Hu, A. C. M. Liu, and J. Wu, “Research and Application of Cloud Storage,” Proc. 2nd International Workshop on Intelligent Systems and Applications (ISA 10), IEEE Press, May 2010, pp. 1-5.
3. J. Wu, L. Ping, X. Ge, Y. Wang, and J. Fu, “Cloud Storage as the Infrastructure of Cloud Computing,” Proc. International Conference
4. on Intelligent Computing and Cognitive Informatics (ICICCI 10), IEEE Press, June 2012, pp. 380-383.
5. D. Zhang, F. Sun, X. Cheng, and C. Liu, "Research on hadoop-based enterprise file cloud storage system," Proc. 3rd International
6. Conference on Awareness Science and Technology (iCAST 11), IEEE Press, Sept. 2011, pp. 434-437.
7. X. Zhang, H. Du, J. Chen, Y. Lin, and L. Zeng, "Ensure Data Security in Cloud Storage," Proc. International Conference on Network Computing and Information Security (NCIS 11), IEEE Press, May 2011, pp. 284-287.
8. R. Koletka, and A. Hutchison, "An architecture for secure searchable cloud storage," Proc. International Conference on Information Security South Africa (ISSA 11), IEEE Press, Aug. 2011, pp. 1-7.
9. L. Hao, and D. Han, "The study and design on secure-cloud storage system," Proc. International Conference on Electrical and Control Engineering (ICECE 11), IEEE Press, Sept. 2011, pp. 5126-5129.
10. H. T. A. Feel, and M. H. Khafagy, "OCSS: Ontology Cloud Storage System," Proc. First International Symp. on Network Cloud Computing and Applications (NCCA 11),IEEE Press, Nov. 2011, pp. 9-13.
11. J. Srinivasan, W. Wei, X. Ma, and T. Yu, "EMFS: Email-based Personal Cloud Storage," Proc. 6th International Conference on Networking, Architecture and Storage (NAS 11), IEEE Press, July 2011, pp. 248-257.

12. Q. He, Z. Li, and X. Zhang, "Study on Cloud Storage System Based on Distributed Storage Systems," Proc. International Conference on Computational and Information Sciences (ICCIS 11), IEEE Press, Dec. 2010, pp. 1332-1335.
13. W. Liu, "Research on cloud computing security problem and strategy," Proc. 2nd International Conference on Consumer Electronics, Communications and Networks (CECNet 12), IEEE Press, April 2012, pp. 1216-1219.
14. F. Machida, E. Andrade, D. S. Kim, and K. S. trivedi, "Candy: Component-based Availability Modeling Framework for Cloud Service Management Using SysML," Proc. 30th IEEE Symp. on Reliable Distributed Systems (SRDS 11), IEEE Press, Oct. 2011, pp. 209-218.
15. B. Addis, D. Ardagna, B. Panicucci, and L. Zhang, "Autonomic Management of Cloud Service Centers with Availability Guarantees," Proc. 3rd International Conference on Cloud Computing (CLOUD 10), IEEE Press, July 2010, pp. 220-227.
16. A.Widjajarto, S. H Supangkat, Y. S Gondokaryono, and A. S Prihatmanto, "Cloud computing reference model: The modelling of service availability based on application profile and resource allocation," Proc. International Conference on Cloud Computing and Social Networking (ICCCSN 12), IEEE Press, April 2012 pp. 1-4.
17. D. Jayasinghe, C. Pu, T. Eilam, M. Steinder, I. Whalley, and e. Snible, "Improving Performance and Availability of Services HostedonIaaS Clouds with Structural Constraint-Aware Virtual Machine Placement," Proc. International Conference on Services Computing (SCC 11), IEEE Press, July 2011, pp. 72-79.
18. Sarddar, Debabrata, Rajesh Bose, and Sudipta Sahana. "An Enhanced Cloud Network Load Balancing Approach Using Hierarchical Search Optimization Technique." International Journal of Hybrid Information Technology 8.3 (2015).

AUTHORS PROFILE

Rajesh Bose is currently pursuing Ph.D. from Kalyani University. He is an IT professional employed as Senior Project Engineer with Simplex Infrastructures Limited, Data Center, Kolkata. He received his degree in M.Tech. in Mobile Communication and Networking from WBUT in 2007. He received his degree in B.E. in Computer Science and Engineering from BPUT in 2004. He has also several global certifications under his belt. These are CCNA, CCNP-BCRAN, and CCA(Citrix Certified Administrator for Citrix Access Gateway 9 Enterprise Edition),CCA(Citrix Certified Administrator for Citrix Xen App 5 for Windows Server 2008).His research interests include cloud computing, wireless communication and networking.

Sudipta Sahana is an assistant professor of a renowned engineering college of West Bengal. For more than 4 years, he has worked in this region. He has passed his M.Tech degree in Software Engineering and B.Tech Degree in Information Technology from West Bengal University of Technology with a great CGPA/DGPA on 2010 and 2012 respectively. He is recently working in Ph.D. in the domain of "Cloud Computing". He is a member of the Computer Science Teachers Association (CSTA), and also a member of International Association of Computer Science and Information Technology (IACSIT).

Debabrata Sarddar, Assistant Professor in the Department of Computer Science and Engineering, University of Kalyani, Kalyani, Nadia, West Bengal, INDIA. He has done Ph.D. at Jadavpur University. He completed his M. Tech in Computer Science & Engineering from DAVV, Indore in 2006, and his B.E in Computer Science & Engineering from NIT, Durgapur in 2001. He has published more than 75 research papers in different journals and conferences. His research interest includes wireless and mobile system and WSN, Cloud computing.