An Electronic Digital Library Using Integrated Security Methods and Cloud Storages

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---**ABSTRACT**---
In earlier days, the customer retrieved library materialized structured information are difficult due to enormous database acted in particular location. This paper deals the privacy and security concern includes threats, attacks, data integrity, data leakage, data availability, loss of control, vulnerability and flaws during distribution of services, resources and information. This technique verifies customer verification and validation between cloud clients and cloud providers. Storing the library information system in digital manner is essential through cloud technologies. As an outcome, library consumers can access resources from outside of physical library using cloud methods. This proposed method enforces the use control and access log technique to reduce the data leakage, improve the efficiency and user privacy of the confidential information. It evaluates the several challenges and issues of cloud such as user authentication, data availability, data confidentiality in a cloud environment. This paper depicted the various investigation reports and reviews of various researchers on electronic digital information based library and its resources by cloud methods and storages. This system provides a scheme of a cloud storages functional construction for building knowledge based digital library. Client's confidential data are stored in global data center storage and numerous local data centers through redundant array of independent disk method in this cloud environment that leads to recovery from the user control and data leakage. This new innovative flexible system delivers the combination of methods like multi-level security with data availability on dissimilar storages, encryption and decryption technique with customer verification and validation method. The electronic digital library resources and services create novel development in scheme of multiple storages with respect to information access and distribution of confidential data in cloud. The multiple cloud storage architecture for digital electronic library offers data handling, speedy transmission of information and linking of communication among library patrons and cloud providers. It will endorse the maturity level from official level members to higher administrate that meet user request and identify the defensible development of knowledge based digital library system. This capable digital library system maintains the cloud computing environment with better performance evaluation. This functional structure progressively established electronic digital library knowledge management by means of user participation. This digital library using multiple cloud storage implementations creates well organized data integration, reduced cost, accessible any-where at any time of services and resources, scalability, elasticity and portability. Furthermore, cloud security and privacy enquiries know the ability of the adaptable digital library system using cloud computing techniques and extent abundant effectiveness with protected cloud environment.

Key words: **Digital library, Authentication, Cloud storage, Data integrity, Security, Privacy.**

I. INTRODUCTION

Cloud computing is the important and foremost internet based distributed computing in Information Technology of real digital world. Cloud provides well-organized environments to enable resource sharing in terms of expandable infrastructures, platforms, middleware and value-added business applications. It can tailored-made and deliver an innovative information services and resources to the common users of cloud environment [1]. It assists consumers to access storage, information, services and resources through internet. Moreover, cloud offering fault-tolerant services with improved recovered performance and provides an identity administration system for millions of consumers simultaneously [2]. Cloud computing provides magnificent cloud storages and virtualization to any application oriented information system. It allows efficient computing capabilities by centralizing global storage, processing and bandwidth. The main features of cloud computing are elasticity, scalability, multi-tenancy, self-provisioning of resources and on-demand self-service [2].

The entire data reside over a global, set of local networked resources, enabling the information and data to be accessed only through secure channel of cloud environment. Since the several local data centers may reside in any geographical location of the world beyond the contact and control of users, there are assorted security and privacy challenges that need to be understood and taken care of. Also, anyone can never deny the chance of a cloud server breakdown that has been observed, rather quite often in the modern times.

Cloud computing offering basic services such as Infrastructure as a Service, Platform as a Service, Software as Service with features like resource collections and allocation, elasticity, calculated measured service, elasticity, scalability, multi-tenancy, self-provisioning of resources and on-demand self-service [3]. A cloud can be public, private, community and hybrid cloud. With the help of cloud environment several crucial things are possible to be done like reduction of utilization in time, save energy in terms of money, ease of use and accessing of technological requirement and so on [4].

Up to this date, several proposals are available for the standardized electronic library system required high impact cloud storage structure for improving interoperability and reusability among e-library information services and resources. The main objective of this paper is to contribute standardization process with an original proposal for functional cloud storage architecture to build standard-driven distributed and internet based interoperable e-library information system. The e-library information management using cloud is combination of information collection, organization and delivery of e-books, e-journals, e-publications, e-applications to library patrons by using cloud storages, public and private cloud in terms of sharing of content and ideas. To ensure information confidentially, data integrity and availability, the cloud service storage provider provides that at a minimum, include:

- Cryptographic method to ensure that the shared and global storage environment safeguards all information.
- Strong access controls and user authentication methods to prevent unauthorized and illegal access to the data.
- Perfect local and global data backup and secure storage of the backup media.
- Multiple cloud storage data center unit such as CloudMe and DropBox to safe the cloud information.

II. REVIEW OF LITERATURE

The customisation of librarianship is tackle with hard disputes in regard to change of technologies, therefore, the appearance of cloud computing has played an important role a library manager more practical and realistic to the services on day to day basis [6,7]. As enlargement of digitized information urges libraries, archives, e-library resource centres to integrate new media's of all types like record labels and film archives and other similar materials into their assortment and repositories. Therefore, this is actually a tough task as the multimedia materials and all other related metadata are very much heterogeneous [8].The libraries of the current creation have observe quick transformation from usual libraries to e- libraries thus, adopting the recently developed system in the form of cloud [9] to redesign and restructure the system of e-information provision and services. Therefore, researchers are determined hard how to find suitable methods of applying cloud to stream line the enormous channel of information in e-libraries and data storage centres in

successful accumulation, storage, preservation and dissemination.

Singh and Veralakshmi [10] clearly mentioned that the cloud methods could help libraries and information centres to maintain proper administration and control over the data incorporation, storage and distribution providing utmost customer's satisfaction. Wang, et al. [11] specifically stated that, "cloud services can share resources ubiquitously. The authors emphasize that the proposed cloud based service can still efficiently backup the given web site that is constructed by Google Sites and allow users save such web site in their local storages". To this effect, they sought the need for cloud vendors to harmonize a series of commercial standards for is successful implementation.

Abidi et al, [12] represent that cloud would help us in bridging the gap between digital libraries and IT by facilitating huger sharing of e-information among other which in turn can reduce the overall cost incurred by the individual libraries. The cost reduction and easy maintenance factor in implementing cloud computing was also addressed by Bansode & Pujar [13]. Huang and Du [14] addressed the feasibility of setting up cloud based digital libraries, digital library architecture and security issues. Chun [15] indicates that cloud provides powerful data storage and web service functions and the model is extremely helpful in digital preservation. Decman and Vintar [16] discussed the need for Digital preservation providing a theoretical framework for modern digital preservation which includes Physical level, Logical level, and Conceptual level.

In keeping up with the latest advanced technology, the Information Centre at CSIR-NAL (ICAST) has adopted in their day to day activities, the concept of cloud computing being one of them. EZproxy is a tool for accessing the held e-resources at the center to authenticated users from outside NAL-ICAST. This allows library patrons outside the 3 campus of NAL from any corner in the world. This allows for downloading the required e-documents like journals e-articles, e-journals, conference papers, e-books, standards, patents, presentations, publications etc.

According to Akhil Behl [18], Data loss is major security issue raised by the customers. When the organizations transfer their information to cloud, the cloud provider not able to guarantee the data integrity and security as they would in their premises, that cause data leakage and loss of control due to multi-tenant policy maintained in cloud environment. The cloud service providers and customers are taking care of cloud security, privacy and protecting the cloud information, sharing of resources, data leakage from malicious attacks or hackers, data intruders in cloud computing. The cloud service provider is another third party that keeps confidential information about the cloud clients or on behalf of, another entity, this leads to data leakage, which is the risk part of cloud environment. Data-centric logging approach allows transparency of data movements, tracking the information, data flow, protection from information loss, corruption, reliable and tamper proof to avoid dishonest alterations by malevolent parties, which reduces the

vulnerability and increasing the accountability, trust and security in cloud environment.

The most important issues on cloud computing is data integrity. The information stored in the cloud may suffer from harm during transition actions from or to the cloud storage provider. Cachinet al [19] shows the examples of the risk of attacks from both inside and outside the cloud provider, such as the recently attacked Red Hat Linux's distribution servers [20]. Another example of a risk to information integrity occurred in Amazon S3 where consumers suffered from data fraud [21]. One of solutions that they propose is to use a Byzantine fault-tolerant replication protocol with in the cloud.

III. ARCHITECTURE OF ELECTRONIC DIGITAL LIBRARY BY INTEGRATED SECURITY METHODS AND CLOUD STORAGES

Earlier, if any user wants to create a document or spreadsheet he/she was using Microsoft's Office package, nowadays many libraries are processing documents, using Google web technology (Google Docs) on day-to-day basis. Nowadays electronic libraries are highly focused on cloud and trying to offer internet based distributed computing services. Moving to cloud-based services means, the library administrative and other operations, digital libraries etc., are hosted on online cloud-based internet. In the modern era, many libraries are using several cloud providers such as Google, Amazon, windows Azure etc., knowingly to provide resource and e-services. The proposed method appraises the problem of various cloud threats, attacks, service availability, data integrity, data loss, information privacy, loss of control, confidentiality and vulnerability during sharing of resources in cloud computing. It prevents scam, fault, misuse of illegal access and rights in cloud computing environment. This system authenticates user verification [22,23] (Hash based Message Authentication Code-HMAC) and identity supervision and strengthen the user and access control through secure path between cloud client and server

The proposed architecture of electronic digital library using cloud security and multiple storage system is depicted in Figure 1.1. Cloud computing involves multiple cloud components that communicate with each other with the help of application interfaces, mostly web services.

The user access control mechanism categorized the user privileged control rights,which helps to restrict and filtering the malicious illegal users. The control and access log are used to verify the user access privileges, control mechanism and seems to maintain the user activities of cloud computihng environment. In order to attain the safe storage and access the secret information on independent global storage through cryptographic method (homomorphic encryption) in cloud environment [23]. The need of filtering is enforced on secure communication channel between cloud service provider and cloud user.

Currently e-libraries are providing good number of services to their users to access various resources, e-services and computer applications from multiple cloud storages like CloudMe and DropBox with back-up storage and cloud service providers e-services with respect to public and private cloud [17]. The various users such as mobile users, PC users and others password should be authenticated by e-library administrator with assist of cloud service provider and Quick Response Code for e-services materials also stored and accessed in cloud storages through e-library public/private cloud and information processing services.

The global data center storage constitutes of several different local data center storages, which maintain and support heterogenenous information of various geographical locations of users secret information and resources. All local data center storages applied the Redundant Array of Independent or Inexpensive Disk (RAID 5 – block-interleaved distributed parity) method. The RAID is data storeroom virtualization technology that joins several disk drive into a consistent component unit for the reason of data redundancy. The use of RAID 5 is a striping with parity across drives which require minimum of three disk storages with high performance and excellent redundancy due to block striping and distributed parity as shown in Figure 1.2.
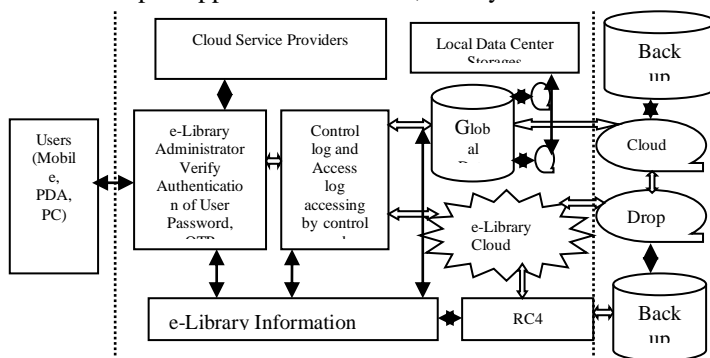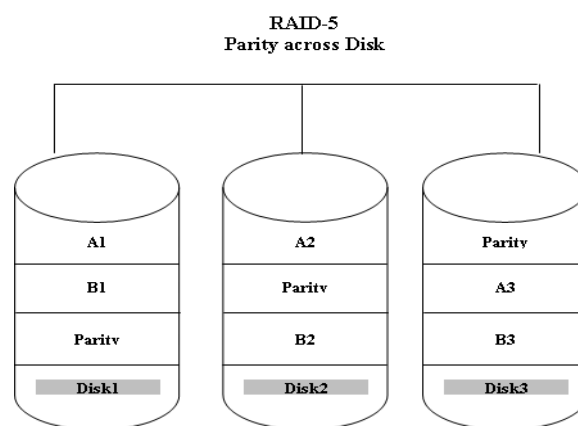
Figure 1.2 RAID-5 stripping with parity across disk storage

Figure 1.1 Architecture for e-Library using Cloud Security and Storage System

The RAID-5 parity across disk storage drive segment is shown in Table 1.1. **RAID -5 Segments**				
Drive 0	**Drive 1**	**Drive 2**	**Drive 3**	**Drive 4**
0	1	2	3	Parity
4	5	6	Parity	7
8	9	Parity	10	11
12	Parity	13	14	15
Parity	16	17	18	19
20	21	22	23	Parity

Table 1.1 RAID-5 parity across disk drive segment

Even failure of single storage drive, subsequent reads can be calculated from the distributed parity such that no data is lost. The users confidential information and data are stored as encrypted form in local and global data storages. The global data center, local data centers and location of resources, files and data are connected through secure communication channel. The secure communication channel serves as encrypted communication path between cloud storages and cloud service providers.

The private cloud e-library services and resources can access by user with the help RC4 encryption algorithm [5]. This architecture has three most important layers such as the Graphical user Interface (GUI), Information Processing Service (IPS) , Cloud Storages (CS) The GUI end is the interface or the main screen that is visible to the customers and the users through which they can interact with the system. This interface can be accessed with the help of web browsers and all the applications can be used with this interface. Usually this interface is based on Graphics User Interface (GUI). The IPS end process the request from user with the assist of cloud service provider accessing the public / private cloud through RC4 encryption from/to cloud storages. The CS end involves all the components and the complete architecture and cloud storage structure with additional back-up storage for recovery of information if any failure or threats appeared in this system which totally remains hidden from the users. Only cloud server knows what is going on at the back end of user request. The back end device includes cloud storage server, Assistant computers and data storage media.

Therefore the main benefit in moving to a cloud environment for a e-library is the ability to try out new software without having to buy the hardware, infrastructure, resources and e-services as well as being able to scale the computing power to meet the demand of users. There are many areas adopted at the storage data center has been computed on the cloud.A library's IT department can be more flexible in raising the amount of cloud computing they require by contacting their vendor instead of physically having to acquire new hardware, software and manpower to meet increased demands. This method will save the library money and staff resources.

IV.PERFORMANCE AND EVALUATION

The elementary objective is to moderate vulnerabilities in cloud and preserve a tradeoff between functional overhead and accuracy, which makes to enhance the performance of cloud security. Initially, we compute the performance of cloud security with respect to resource appeal size or file size sz, trial measurement ratio w, and resource appeal number or sector per resource pooling or block s. This illustrates that the value of s should raise with the increase of sz to decrease computational and communication costs [24].Thus the computational and communication costs increase gradually with growth of request resource or file size and sample measurement ratio as shown in Figure 1.3.
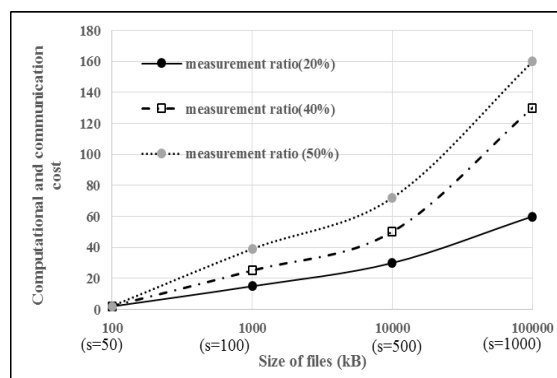

Fig 1.3 Computational cost and various dimensions of files

Figure 1.4 shows the experiment results, in which the computational and communication costs of distribution and decrease of threats on cloud are changed for dimension resource processes, but those for decrease and response grow with the growth of sampling resources processes which makes to decline of 80 percent of attacks, threats with greater response in cloud environment [24].
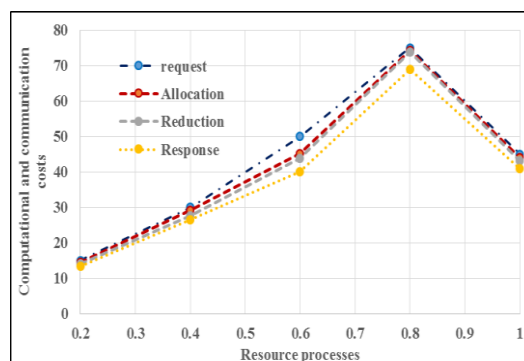

Fig 1.4 Decline of greater number of attacks, vulnerability and flaws on file size

V. CONCLUSION AND FUTURE WORK

e-Library face rising challenges in managing the assets of their collection and maintaining service levels to patrons. For the past two decades, libraries have reached out their services to its patrons, initially offering physical forms to adding multimedia items at an advanced level through electronic media. In recent years, impact of cloud computing technology has been tremendous on the library and information storage data center's like CloudMe and DropBox and the developments are for all to witness.

Perceptibly, presently the usage of cloud computing has gradually increased day-by-day, but cloud threats, attacks, security and privacy are still measured and it has been the major concern in the cloud computing. To protect confidential information, data's and sharing of resources in cloud environment against vulnerability and flaws, a safer cloud environment is required, therefore proposed a suitable authentic secure storage access mechanism through cluster method for cloud using RAID technique should be enforced. This paper deals several security and challenges in terms of privacy, data intrusion, data leakage, data integrity and confidentiality of cloud environment. This paper verifies user authentication and keep track of user activities through access and control logging mechanism. The passing of information and sharing of resources through cryptography method between cloud user and service providers. It deeply appraises the cloud users to store and access the confidential data's securely by cluster method from the cloud disk storage. The information are stored in global data center and multiple local data center storage through redundant array of independent disk technique of cloud computing environment.

The cloud computing is an emerging technology which entails the reduction of in-house data storage centers and the delegation of a portion or all of the Information Technology infrastructure capability to a third party. Universities and Colleges are the core of innovation through their advanced research and development. To cope up with the new technological innovation in the field one needs to know and explore cloud computing. The proposed architecture adopts multiple cloud data center storages with processing e-library services and resources on-demand by authentication of user password, one time password and quick response code with assistance of cloud service provider's services in terms of public/private cloud. Future research on this work may include the development of interfaces, standard and specific protocols that can support confidentiality and integrity in e-library in cloud.

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