

## Efficient Data Storage and Retrieval System Using Own Cloud for Higher Education Institutes

Ansari Zakir<sup>1</sup>, Khan Tabrez<sup>2</sup>, Syed Kaleem<sup>3</sup>, Syed Shariq<sup>4</sup>

<sup>1,2,3,4</sup>Anjuman-I-Islam's Kalsekar Technical Campus, New Panvel, Navi Mumbai

<sup>1</sup>hod.me@aikt.ac.in,<sup>2</sup>hod.co@aikt.ac.in,<sup>3</sup>hod.ee@aikt.ac.in,<sup>4</sup>dean.sop@aikt.ac.in

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**Abstract:** In institutes of higher education, record keeping and its retrieval has always been a problem. Often it is required that the same documents which originated from a common source are to be used by multiple users at different places for different purposes. This puts forward multiple challenges ranging from timely retrieval to data security. To overcome all such issues, a safe, secured, updated and efficient retrieval system is installed, configured and maintained at the institute level using open source cloud software called Own cloud. The user groups have been created program-wise. Then the user accounts are created for every faculty and added to specific program group. A directory structure has been created considering the common administrative and teaching-learning requirements of the programs. This structure has been shared with all the faculty members of the respective program. A write access or read access is provided to all the concerned users through which each user has required access on fly. Every faculty user has 1 GB quota and department clerk has 10 GB quota, which can be used to store individual's teaching-learning and administrative records. Such implementation has provided an immediate and efficient access to all the teaching-learning and administrative records at any point of time and any location.

**Key words:** Data Storage and Retrieval system, Cloud Storage,

### 1. Introduction:

In higher education institution, the data storage and retrieval is always been a problem. The same data such as students list, their exam results, academic credentials is required at multiple places by different users. This leads to pressure at the origin or source of the data which has to provide service to all the users. Also the changes (if any) made at one place are not visible at others places which leads to confusion. In view of all these problems it was required to have a system which would provide facilitation to all the users of the data at the same time. Also the changes made may be seen by all the users and they could update their data accordingly. The proposed system uses a public cloud called Own cloud to store the applicable data at a single place. The read or write access can be given to different users as per their requirements. This ensures that the data is available to all the users at all the times and they

can also access it from any remote location. This can also be extended for keeping the e-learning content and resources on the cloud and giving access to the students by creating their accounts. It also happens that a faculty member was made incharge for some event conducted in a particular program. The various sub events of the program are subdivided among many faculty members who maintain the details of sub events. At the end all such details possessed by many faculty members have to be consolidated by a single person. To get all the details from different faculty members and to consolidate it becomes an issue due to unavailability of all the concerned at the same time. Using this cloud, every detail of that sub event can be uploaded by the respective faculty which can be consolidated by a single person by referring the cloud. This uploaded information of the event is now holistic from invitation to contents, photographs, feedback etc. Now this holistic report becomes a useful document from NAAC and NBA accreditation perspective. Fig.1 gives the idea of using own cloud by different user groups.

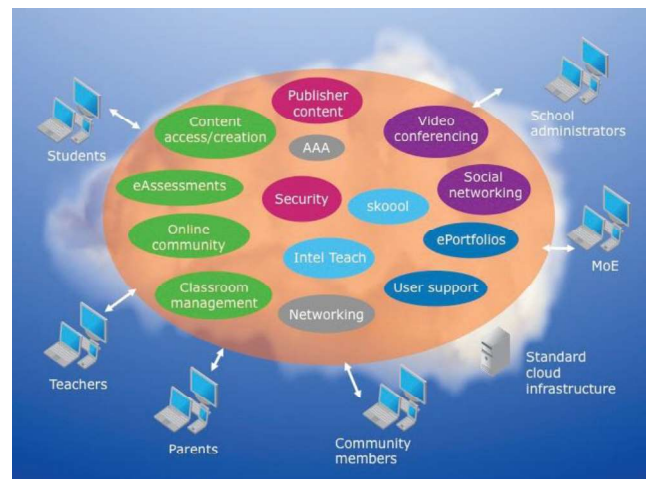


Fig. 1 General Idea of proposed method (Robert Fogel)

### 2. Related work

There is sufficient research work available in the filed of cloud computing as a tool for teaching learning practices, a few authors have done research in the filed of application of cloud computing for administration and governance. In one of the research works, the attitudes and behavior of the the students of this digital era towards use of Mobile Based Cloud Computing was evaluated as the students are more comfortable with information management practices

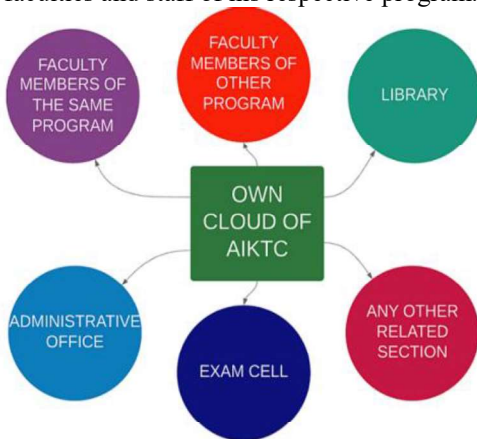
(Storing, Retrieving, Share and Apply). In this work a survey of 384 students was conducted to know the attitudes and behavior of the the students of this digital era towards use of Mobile Based Cloud Computing for learning in higher education. The results were later validated using machine learning algorithms. It was concluded that Mobile Cloud Computing should be supported and Encouraged in higher education (Ibrahim Arpacı, 2019). In another work it was demonstrated that the steps for transition from conventional IT infrastructure to cloud based system reduces cost of handling and maintenance of the hardware. This is an important aspect in the current scenario. The transformation can be done in five stages which includes Preparation, Analysis, Migration, Concluding the migration and Maintenance and Vendor Management phases. The details of action plans during each phase were also presented. (Vaishali Pardeshi, 2014). In yet another work the use of cloud instead of physical resources for handling huge data at university level was presented. A simulator has been proposed which can be used for keeping the data at cloud for its effective use by different users. The framework consists of a cloud developed for processing university's database which consists of staff and students information. The proposed system has the following features (i) support for cloud computing infrastructure, which includes data centers containing university database; (ii) a user friendly interface; (iii) flexibility to switch between the different types of users; and (iv) virtualized access to cloud data. (Kashish Ara Shakil et al). Md. Anwar Hossain Masud and Xiaodi Huang (2013) presented an architecture of mobile based cloud computing which would benefit the student learning. It was also evident that the proposed architecture would help students and staff in their respective tasks. In another work a cloud based smart education system was proposed wherein it was shown that the contents can be updated by the institution and it can be used by the users through the cloud. Six major elements/requirements for the cloud based smart education system were explained which includes cloud platform, compatible file format, authoring tool for content developers, content viewer, interface engine and a security system. It was concluded that the use of cloud computing in education would facilitate students learning. (Ji-Seong Jeong et al, 2013). The advantages, limitations, challenges and future scope for the use of cloud computing in higher education were presented (Anjali Jain and U.S. Pandey, 2013). The use of cloud computing for e-Governance by Government of India was presented. National e-Governance Plan (NeGP) model was presented applicable areas of cloud computing for e-Governance such as for issue of passport, birth and death certificate etc were presented. It was concluded that by adopting to cloud based e-Governance there would be ease in governance and the efficiency would be improved. (Deka Ganesh and Robin Singh Bhadoria, 2012). The impact of cost saving by implementing cloud based e-Governance was discussed. How some countries have used Government cloud to integrate various ministries and other applicable sectors

was also presented. (Kishori lal Bansal et al, 2012). Combining e-Learning and cloud computing from the point of view of architecture, construction method and external interface with the model was presented. Cloud e-Learning is compared with the conventional e-Learning models. In the current cloud based e-Learning model, interactions among groups such as teachers students etc are possible also content development, content management, the layer by layer structure of the proposed system was explained. The improvement in connectivity between university, study centres and colleges was also elaborated. (Md. Anwar Hossain and Xiaodi Huang, 2012). Survey of cloud computing used by Governments across the globe was presented. Different types of clouds and layers of cloud computing were also explained. The rankings of Governments using cloud computing for Governance revealed that at the top Singapore uses 92.14 % e-governance for its operations while Netherlands uses 70.75% e-governance which stands at the bottom of the provided list (Kuldeep Vats et al, 2012). The possibilities of using cloud computing to provide quality education at less cost were presented. The paper also discusses the advantages that the teachers, faculties and administration staff would be getting by using cloud computing in education. A few case studies of implementation of cloud computing in education were also discussed. (Deka Ganesh and Malaya Datta Borah, 2012). A step by step four stage guide for implementation of cloud computing in educational institution was been presented. (Md. Anwar Hossain et al, 2012). Existing examination system at Indian universities was discussed, its drawbacks were presented. An alternative cloud based system of examination at Indian Universities was proposed. Challenges of integrating ICT in education were also shown. (Mohini Bhardawaj and Amarjeet singh, 2011). The idea of using cloud computing for educational organization specially university was presented. A frame work for using the computing techniques of cloud for administrative and learning scenarios were described. A survey revealed that the cloud based techniques are seldom used educational organizations (Tuncay Ercan, 2010). In one of the researches, the Cloud Cube Model (CCM) was modified and a new model called complete cloud computing formations (C3F) was presented. It was named as cloud computing for Education and Learning (ELAas) (Mohssen M. Alabbadi, 2011). The use of cloud computing for educational institute, its Architecture was discussed. Advantages and challenges associated with cloud have been discussed. (S. Sasikala and S. prema, 2010). A brief overview of cloud computing in educational institutions has been presented with guidelines for the deployment. The advntages, threats and deployment guidelines of cloud computing in education has been discussed. (Niall Scalter, 2010). The transformation in education due to affordable hardware and internet facilitates the use of ICT tools for learning. The paper tells about how the students of 21 century can acquire the essential skills required to remain competent through education cloud. The service providers

and users perspective towards cloud based service was also explained diagrammatically. This paper forms the frame work of educational cloud wherein the use of cloud computing through the service provider for education and research has been shown.(Rober Fogel, 2010).

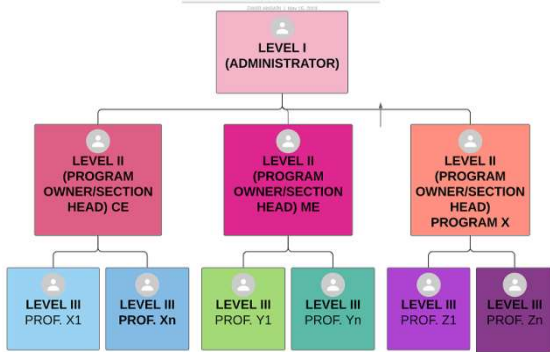
**3. Methodology**

Fig. 2 shows a mind map plot of interactions of different groups within an institute with the cloud. The entire cloud can be divided into 3 levels. Level 1 is at the administrator, who creates users for different departments and users. At level 2 the control would be given to the program owner/Section head who will give different rights to various faculties and staff of his respective program.



**Fig.2 Interactions of different groups with the cloud**

At level 3 the individual faculties and staff would be provided the access.Fig.3 shows various levels of functioning at the cloud.



**Fig.3 Hierarchy of the cloud**

**A. Level I (Administrator)**

This level is for the administrator who will create the user groups as per the programs and sections. The Read or Write access to individual members for different data can be provided and controlled through this level.

**B. Level II (Program Owner/Section Head)**

This level is controlled by programs owners and section heads. Some of the common information such as different formats, students lists, student attendance, students’ exam marks etc can be shared with all the faculty members while some other information pertaining to a specific faculty or group of faculties can be shared with that group only such

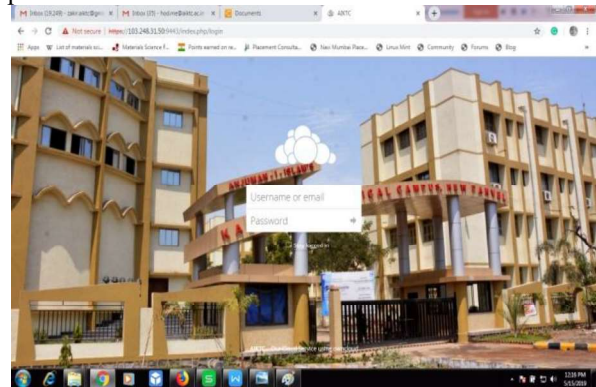
as departmental exam coordinators or training and Placement coordinators etc.

**C. Level III (Faculties and Staff):**

At level III the faculties and staff would have access to different data as provided at level II. They also can keep their credentials such as their publication details, any achievements, learning materials developed for the students and can share it with appropriate faculties and staff. As an example the assessment results of the course taught by a faulty can be shared with the department exam coordinators and with the program owner as it is more related to them.

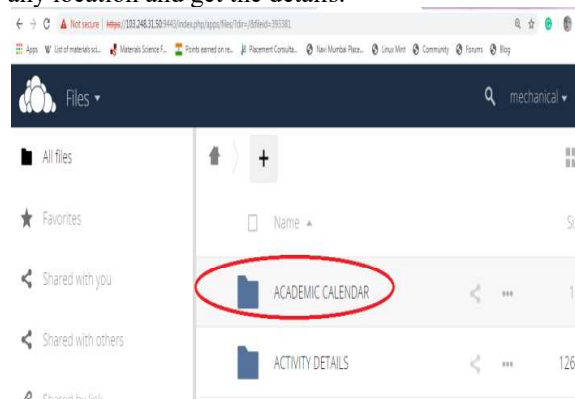
**4. Case Study**

From the perspective of NAAC preparations it was decided at the institute to update the academic files of the course owners for the last five years. There are some common contents of the academic file such as academic calendar, Time tables, teaching load office order etc which were to be used by all the course owners for updating their files. In the ordinary situation, all the data was to be provided to all the course owners of a particular program from the departmental clerk which would have made the clerk busy in this task.The cloud was used for this purpose. Fig. 4 shows the window asking the user to login with his password.



**Fig.4 The front screen of own cloud**

The relevant data was kept in separate folders for different academic years and access of the same was given to all the course owners. Fig. 5 shows the academic calendar folder kept on the cloud and shared with all the faculty and staff of that program such that they can access it remotely from any location and get the details.



**Fig. 5 Academic Calendar folder on cloud**

The academic calendar folder contains the respective years' academic calendars in excel format as indicated in Fig.6

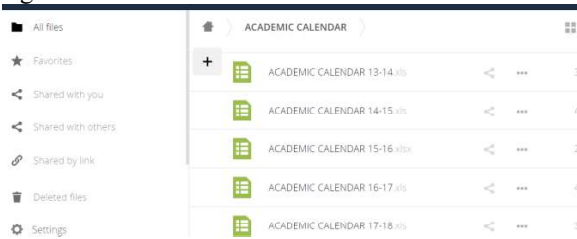


Fig. 6 Academic Calendars of last five years

The users can download and print the academic calendar so as to keep it in their respective files.

### 5. Conclusions and Future Scope

It is therefore concluded that, the use of cloud computing for administrative purposes at educational institution would lead to following advantages

1. Reducing the efforts of an individual to provide same data to multiple users.
2. Update of the data at one place would ensure that all the users can get the updated copy.
3. Easy sharing of relevant information among different user groups requiring the same data.
4. The required information about number of faculty publications, trainings etc would be readily available to the concerned program owner at any point of time.

A lot of literature is available on the use of cloud computing for e-Learning and mobile based learning. The same cloud which is proposed here could be used as a Learning Management System (LMS). The students can be given access and they can be provided with learning materials through the cloud in future.

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