

Cloud Based Document Storage System for a Higher Institution

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Abstract— Cloud storage is the latest way of storing files and documents, online, making the files readily accessible at any point in time. In this research work, a web based cloud storage application which is device/browser responsive and has a user friendly graphical interface, was developed. PHP/MySQL technology was used, to achieve this development, with the concept of MVC (model view controller) so as to make code extension and management easy. Twitter bootstrap was also incorporated, to make the application responsive to any device and browser.

The web browsers of commonly used devices, by staff and students of university of Ilorin, Ilorin, Nigeria were used to show the responsiveness of the application. The application responded without discrimination.

Keywords- *cloud computing, cloud storage, MVC, twitter bootstrap, responsive, secured socket layer*

I. INTRODUCTION

Cloud storage is an aspect of cloud computing, where storages are online and users connect to them remotely from their personal computers, phones and other digital assistants. Users store their data without even having the knowledge of where the storage is located. With this, users can have access to their data on the go, as long as they are connected or online.

Many cloud storage systems are in existence presently, powered by different providers and many staff and students have subscribed to such providers. Examples are mega cloud, i-cloud, Google drive, drop box, SkyDrive etc. [6]. Most of these providers require a user to install the cloud storage software on their PCs, PDAs or mobile devices of the users and provide a backup which can be accessed or retrieved at any time. Therefore, if such a device is stolen or damaged, the cloud storage system ensures that the stored documents are preserved.

II. CLOUD STORAGE

In simple terms, [9] defined cloud storage as a storage, located, remotely, which can be accessed anywhere. It's like storing your files online and accessing it anywhere while using your laptop, mobile device or another PC with the benefits of accessing files at any point in time, sharing of files and also provide backup.

Reference [11] also describes cloud storage as a model of data storage where digital data is stored in logical pools, the physical storage spans multiple servers and the physical environment is typically owned and managed by a hosting company which is responsible for keeping the data available and accessible, and the physical environment protected and running.

Fig. 1 shows that mobile devices, servers, personal computers, browsers and APIs can be used to access enterprise cloud storages, it also allows the collaborations between users, by sharing of files and resources, even secured storage can also be linked to enterprise cloud storages to provide backup.



Figure 1: Enterprise Cloud Storage

TYPES OF CLOUD STORAGE

According to [10], Cloud storage is majorly classified into four types namely;

- **Personal Cloud Storage:** This is also referred to as mobile cloud storage. It is a subset of public cloud storage that applies to storing an individual's data in the cloud and also provides such individual with access to the data from anywhere. It also provides data syncing and sharing capabilities across multiple devices.
- **Public cloud storage:** This is a type of cloud storage where the enterprise and storage service providers are separate and no cloud resource is stored in the enterprise's data centre. Therefore, the cloud storage provider completely manages the enterprise's public cloud storage.
- **Private cloud storage:** With this type of cloud storage, the enterprise and the cloud storage provider are integrated in the enterprise's data center. The cloud storage provider has infrastructure in the enterprise's data center and is typically managed by the storage provider. It helps resolve the potential for security and also all the benefits of cloud storage.
- **Hybrid cloud storage:** This is a combination of public and private cloud storage where some critical data resides in the enterprise's private cloud while other data is stored and accessible from a public cloud storage provider.

III. CLOUD STORAGE REFERENCE MODEL

Cloud storage has the same attributes that define other cloud services like pay as you go, elasticity, and the simplicity of use and management. Therefore any interface for cloud storage support these attributes. As shown in fig. 2, the SNIA Cloud Data Management Interface (CDMI) is a functional interface that applications use to create, retrieve, update and delete data elements from the cloud. As part of this interface, the client can discover the capabilities of the cloud storage offering and use this interface to manage containers and the data that is placed in them [5]. The interface is used by both administrative and management applications to manage containers, accounts, security access, monitoring, billing information, and also for storage that is accessible by other protocols [5].

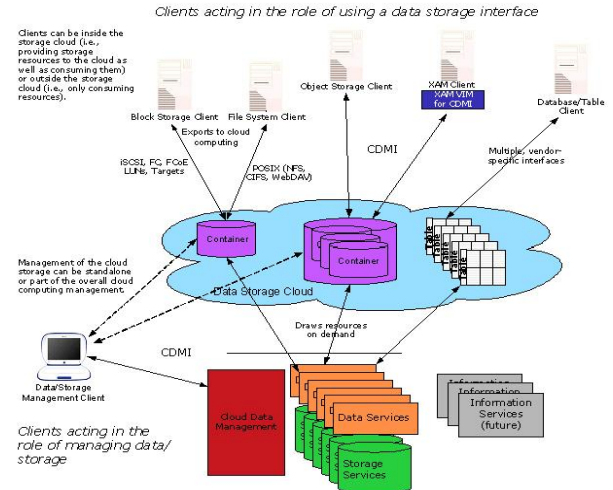


Figure 2: Cloud Storage Reference Model

IV. RELATED WORK

Reference [1] studied the issues challenging the adoption of cloud storage system in Nigeria. The authors found that security, privacy and trust, internet connectivity, infrastructure and social amenities, institutional environment legal and regulatory frameworks are the major challenges of adopting cloud computing in Nigeria.

Reference [3] developed a secure cloud storage system. This system supports a secure data forwarding approach over encrypted and encoded message. The authors adopted threshold proxy re-encryption scheme for securing data.

Reference [4] proposed a threshold proxy re-encryption scheme to form a secure distributed storage system. The system allows users to forward data on the storage server to other users without retrieving the data back.

After the introduction of cloud storage reference model, [2] identified the advantages and challenges of the cloud storage. The advantages are: ease of management, cost effectiveness, simplified planning, lower impact outages and upgrades, disaster preparedness and the challenges are: security, cost, data integrity, power, replication time and costs, reliability.

V. METHODOLOGY STRUCTURAL FRAMEWORK AND DESIGN

A web based application that runs on Linux operating system server was developed. The application is structured and developed in a way that makes code extension and code management easier. Bearing in mind the difficulties involved in structuring and developing software led to choosing the best software developing concept/pattern that suits this application. This was achieved using the concept

of MVC (model-view-controller). Fig. 3 shows how MVC works.

The controller: This is in charge of directing traffic to where it needs to go, figures out the view that is to be loaded up and also interacts with the appropriate models. For instance, when a person logs in to his/her personal storage account, the controller tells the application that it needs to load the login form view. On login, the controller loads the model that handles logins, checks if the username and password matches with what is stored on the database, if it is successful, the controller will then pass the person to the first page after logging in [7, 8].

The view: This is the visible interface that the user interacts with, display buttons, forms etc. The controller calls up the view after interacting with the model which is what gathers the information to display in the particular view [7, 8].

The model: This is where data from the controller and sometimes the view is actually passed into, out of and manipulated.

The MVC pattern allows programmer to isolate these very separate pieces of code into their own domain, making code maintenance and debugging much simple than if all these items were chucked into one massive piece [7, 8].

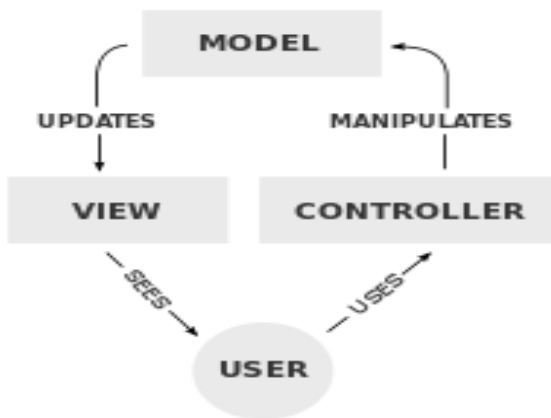


Figure 3: How MVC works

The application was developed using PHP/MySQL technology. Twitter bootstrap was also incorporated to make the application responsive to all devices and browsers.

SSL (Secured Socket Layer) was used for transmitting private documents via the internet, which creates a secure connection between a client and the server, over which any amount of data can be sent securely.

Device	Browser	Test Result
Amazon Kindles	Silk, dolphin	Responsive
Personal computer (lap top/desktop of 32 and 64 bits)	Google Chrome, Mozilla fire fox, opera, internet explorer, sea monkey, safari, Netscape, maxthon, Torch.	Responsive
Apple Iphone/ Ipad	Chrome, firefox, opera and safari.	Responsive
Samsung galaxy notes/tabs		Responsive
Nokia (X series, lumia, Asha series)	Opera, UC browser, chrome, internet explorer.	Responsive
Tecno Tablet/phones	Opera, chrome, UC browser.	Responsive
Sony phones	Opera, chrome, UC browser.	Responsive
LG phones	Opera, chrome, UC browser.	Responsive
HTC phones	Opera, chrome, UC browser.	Responsive
Blackberry phones/playbooks	Uc browser, opera, dolphin.	Responsive

VI. RESULTS AND DISCUSSION

A survey showing the result of the responsiveness of the cloud storage web application to several browsers on several devices is shown below in figure 4. The sample devices used for the test are devices commonly used by staff and students of University of Ilorin, Ilorin, Nigeria. The developed application responded without discrimination.

Figure 4: A table showing the responsiveness of the application to the browsers of commonly used devices in University of Ilorin.

A. LOGIN COMPONENT

Figure 4 allows existing users to login to their account and recover their password when they forget by clicking the hyperlink "forgot your password?" Also a new user can register by creating a new account.

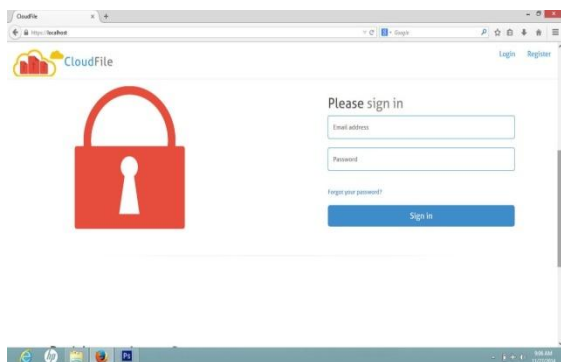


Figure 5: Login component view

B. FILE MANGER COMPONENT

Users who have successfully logged in to their accounts are allowed to manage their files with this component as shown in fig. 5 by performing the following operations such as; upload, delete, rename, share and download. Users can also organize their files into folders and also have knowledge of the memory space they have used and have left.

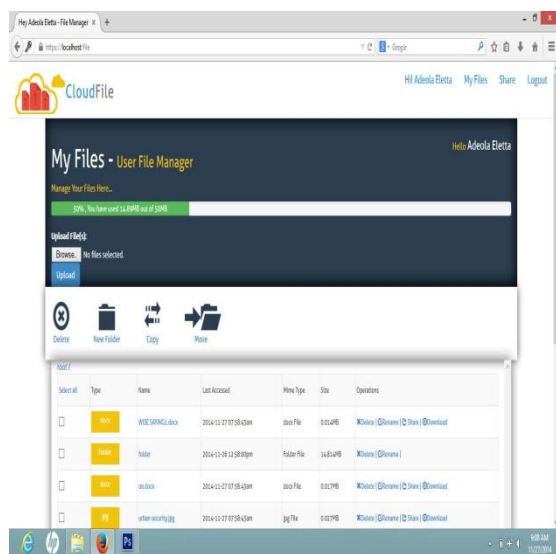


Figure 6: File manager component

VII. CONCLUSION, RECOMMENDATION AND FUTURE WORK

This application allows new users to register for an account, also existing users can reset their password if they can't remember, and it also allows existing users to upload, delete, rename, share, and download their documents. The application is optimized to support all web browsers, mobile devices, computers, personal digital assistant.

It will be good for a higher institution to have their cloud storage that can be accessed via the internet and on the intranet of the institution. An application that is web-based, device and browser responsive and does not require a user to install any special software is recommended.

With this application, a higher institution can have documents on the go, bring about collaboration between users, provide backup thus saving the cost of purchasing storage devices and also generate revenue by selling storage space at a subsidized amount for members of the institution.

Our future work is to provide maximum security for stored document and also add more features to the application so that users can edit and modify their document on the application platform online.

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