

Information Retrieval System for National Health Insurance Scheme Hospitals in Nigeria

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Abstract

Improper data storage, insecurity of patient medical records, difficulty in accessing quality healthcare services, high cost of medical services, and inaccurate diagnosis due to lack of access to proper patient information are among the major problems of health care delivery in Nigeria. This paper presents a cloud based patient information retrieval system for National Health Insurance Scheme hospitals in Nigeria. The system divided the hospitals into four regions with each region having its own server that connects to the cloud databases. Before accessing the cloud, each user undergoes three processes; registration, activation and verification. User registration ensures that access is given to registered hospitals; activation and verification to prevent intruders from having access to patient information and guarantee confidentiality of such records. The model will be implemented using object oriented programming and the performance evaluation is based on major parameters such as delay, bandwidth utilization, and throughput.

Keywords: Cloud, health care, patient information, verification, database, access

1.0 Introduction

In the last few years, massive information computing power is desired to generate business insights and competitive advantage [1,2]. Operating a private data centre to keep up with the rapid growing data processing requests can be complicated and costly. However, cloud computing is an alternative - a technology that uses the Internet with remote servers to maintain data, software and applications[3,4]. Cloud computing provides on-demand computing power with quick implementation, maintenance, and lower cost. It allows users to use their local machine to access personal and official files on any computer with internet access[5,6,7]. Cloud computing provides an environment that allows hospitals, medical practices, insurance companies, and research facilities to tap improved computing resources at lower initial capital outlay. It gives a platform that reduces the barriers for innovation, modernization of Healthcare Information systems, and other healthcare related applications. It also facilitates the sharing of information among authorized physicians and hospitals in various geographic areas, providing more timely access to life-saving information there by reducing the need for duplicate testing [8,9,10,11]. Applications, services, and data can be accessed through a wide range of connected devices (e.g., smart phones, laptops, and other mobile internet devices)[12,13,14]. Therefore, the process of cloud computing is being done through set of web enabled applications loaded on the server with proper access rights.

Health is an issue of central concern to all countries and societies as it is a crucial cornerstone for socio-economic progress. The fundamental struggle to provide good health care to all in the society is a social goal whose realization requires the action of many other social and economic sectors in addition to the health sector. In Nigeria today, health care challenges have resulted to a high number death and morbidity in the regions because not every aspect of the health care delivery system has been automated which is thought to be the lack of application of Information and Communication Technology (ICT) to guide information retrieval and decision making processes. Others measures, such as providing accurate medical diagnosis, improving health status of patients using adequate information retrieval system are necessary. Accurate medical diagnoses often aid therapy administration and as well improve the health status of patients [14]. Improved health status leads to increased productivity, educational performance, life expectancy, savings and investments, and decreased debts and expenditure on healthcare [15]. This has brought about the introduction of Health Management Information System (HMIS)

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into National health Insurance Scheme (NHIS). This facilitates health care provider under the umbrella of NHIS in delivering effective patient-centric service and facilitate decision making with anytime, anywhere access to information which is a vital part of today’s healthcare delivery system.

This paper presents a cloud based model to enhance health care delivery system in Nigeria hospitals. The model aims at providing a unified platform to efficiently aid medical practitioners to adequately monitor patient information by securing their medical records to assist in decision making processes.

Several research works have been done in the area of application of cloud computing in health management. The socio-economic and geographic differentials in costs and payment strategies for primary healthcare services in Southeast Nigeria was carried out [16]. In [17], health system performance in developing countries was assessed. The role of information systems in healthcare was discussed in [18]. A critical issues and strategies for enhancing the use of primary health care services in Nigeria by the rural communities was presented [19]. In [20], a study on the accessibility problems of primary healthcare to rural people in Jigawa State, Nigeria was presented. A review-based comparative analysis of assessing equity in health care through the national health insurance schemes of Nigeria and Ghana was done [21]. In [22], a discussion on the prospects and challenges of health care financing was carried out. In [23], an examination of artisan reactions to national health insurance scheme in Lagos State, Nigeria was demonstrated. The need to scale up private sector participation in Nigeria to accelerate reforms in healthcare financing was provided by [24]. In [25], a descriptive study of strengthening primary healthcare through community involvement in Cross River State, Nigeria was conducted. The challenges of implementing sustainable health care delivery in Nigeria under environmental uncertainty was studied [26]. All of these researches showed the status of the national health insurance scheme in Nigeria.

2.0 System Architecture

2.1 The Cloud Model

In this study, architecture of cloud database is implemented to establish a public cloud within the NHIS hospitals accessed through the regional servers. For any cloud service it is mandatory to keep some criteria for evaluation of database, application, hardware configuration, which are available for cloud.

Figure 1 shows the architecture of the proposed system model. The national hospitals are divided into four major regions based on the geographical location Nigeria. Each region has a server that connects to the cloud for information access. A user connects through the regional server for authentication before linking the central cloud sever to access services in the cloud. Also data, application and other resources could be shared within the hospitals that constitute the network, but the back bone of the computer network information source is the central server. The central server retrieves information resources from the cloud database and sends queries issued by the users from the NHIS hospitals at the user terminal. This approach enables medical

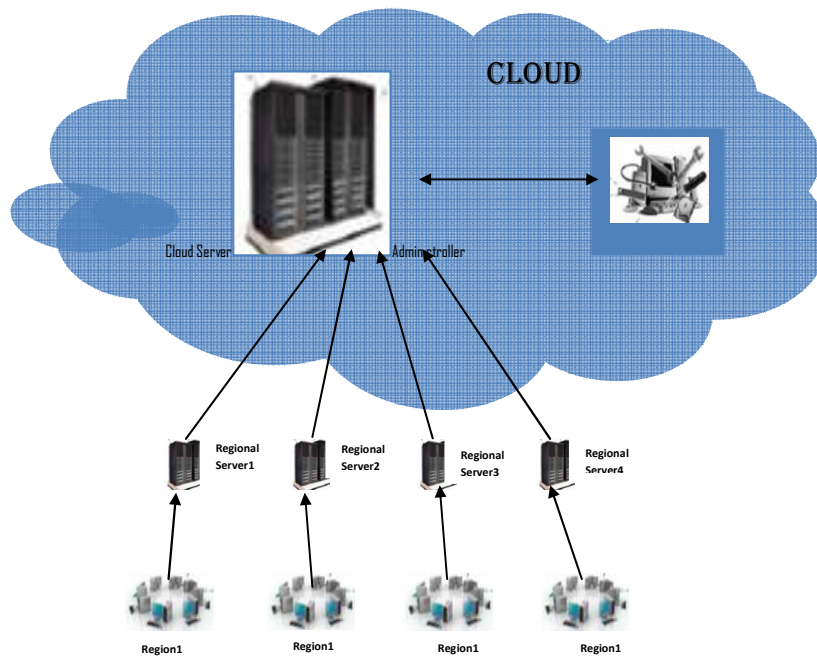


Figure 1: System Architecture

Practitioners to be able to retrieve patient information from any part of the country. It also allows patients to have access to any of the NHIS hospitals available within his/her area without further re-registration. The system algorithm is shown in figure 2.

The assumption is that all NHIS registered hospitals in Nigeria come together to form a public cloud and provide the storage server, application and database related services. Data is stored in the server of the cloud service providers. The provider assigns username and password to each registered hospital and in turn assigns to their respective patient for further use.

The administrative control node holds the registry of every user of the cloud, to regulate access to the database when a registered user outside her domain wants to access resources from her end. Code is generated on the application and then the database is created on data storage

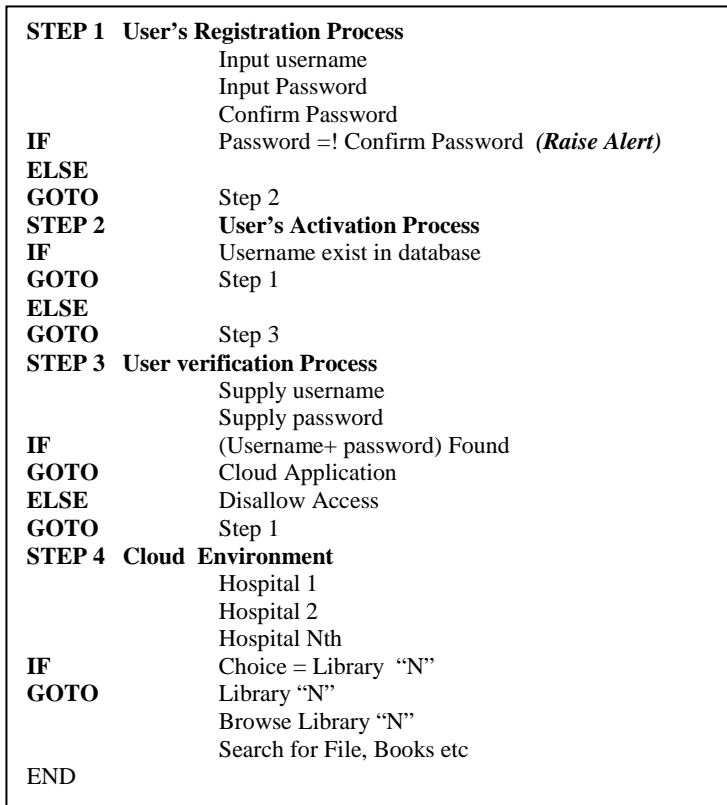


Figure 2: System Algorithm

server. After database creation, an administrative control node creates records and save it on the server. On the other hand, the saved data is available on computer network and finally user can access the data stored in the server in various forms.

3.0 System Implementation

A health-cloud application manager is developed and the application is installed on the local computer of individual NHIS hospital, access the regional server and connect the user to the cloud environment for information access. Also, before the hospitals are given access to their resources, authentication process must be done. This comprises of; Registration, Activation and Verification Processes.

(i) **Registration:** The registration process represents the first step of risk management defense. The usual practice by hospitals is to confirm an applicant's information through multiple data sources. The user registers a unique user name and a password as an identification identity to be a licensed user of a cloud.

(ii) **Activation Process:** Hospital authorities build in intrusion control where a new user registers with the hospital. When calling to activate the license, a flag may be raised if the user does not originate from the actual registered user. In such circumstances, rather than automatically activating the account, the user is referred to a service representative who attempts to verify the user's identity using other information supplied during registration process. User activation process prevents fraud or unauthorized access.

(iii) **Verification Process:** Cloud providers also build further a regulated intrusion control when a user's application for login is presented. If the username and password presented correlate with that in the data base, then an access is allowed else

there will be a denial.

The proposed model is evaluated based on these major parameters: delay, bandwidth utilization, and throughput.

4.0 Conclusion

This work has provided means by which patient information can easily be retrieved by health practitioners across the country for decision making and proper diagnosis. The system removes the headache of information gathering to facilitate effective and efficient practices in the health care delivery. The result of its deployment will bring about an improved information access and economic development in the health sector which invariably improves the life span of every individual in the country.

5.0 References

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