A New Cloud Computing Solution for Government Hospitals to Better Access Patients' Medical Information

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Abstract In this paper, we are proposing a new cloud computing solution for government hospitals of 3rd world countries to better access patient's medical information. Existing system is based on manual paper work and independent standalone applications in some districts'/ small towns' hospitals which results in waste of resources, high construction and maintenance costs and difficult to manage and maintain. The main objective of proposing cloud based solution is to reduce the cost (construction and maintenance), to reduce data loss risk, to gather all the government hospitals on one platform to better access patients' medical information for easy management and maintenance. The proposed cloud computing solution is intended to be used by government hospitals of 3rd world countries; however the solution is generic and can be used by government hospitals of any country and the community based hospitals.

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1. Introduction

Significant improvement in Science and Technology has changed our lives and our life styles. Cloud computing, Big data, and Data mining are the hottest topics or research areas in the field of Information Technology. Researchers are focusing these areas for better improvement. A simple example of data mining can be predicting student success as given in [1].

In contrast to the above improvement, health care services are improving and hospitals are continually improving their services. The Government of 3rd world countries is trying to continuously improve healthcare services by computerizing the hospitals' whole system through their Ministry of Health. Nowadays most of the hospitals are managing their operations and medical information through Hospital Information System (HIS).

A typical HIS system can have the following sub systems or modules and can have more:

Information security has always been a big issue as the number of malware/malicious attacks is increasing regardless the improvement in the area of information security. The network connection (internet) is never thought of and realized as an effective and most safe connection. Due to the lack of proper technology (safe internet) government hospitals has established independent and standalone HIS systems in some districts / small towns. These independent standalone HIS systems require high construction and maintenance cost; hence the information sharing is a big issue. The main objective of

the paper is to reduce this high cost and to provide a better way for information sharing between government hospitals of different districts/ towns.

Our research paper is organized as follows: In Section 2 we describe the problematic issues of existing HIS and motivation of our research work. Section 3 is about the background of Cloud computing. A new cloud computing solution is proposed in Section 4. We have concluded our research work in Section 5.

Figure 1.1. HIS System

2. Motivation

As described above, the current independent standalone HIS system only serves to the specific hospital of any

specific district/small town. These independent HIS systems have raised some major problematic issues that are hard to avoid.

2.1. Data Sharing

Currently, most of the hospitals (either district hospital or town hospital) are maintaining patients' medical information and some staff management operations manually (on papers); however some of the hospitals have their own independent standalone HIS system. This creates a high risk for data loss and the problematic issues in data sharing. The main problematic issue is that the patients could not seek proper treatment in any hospital of the other district or town because of the existing independent information systems due to lack of data sharing.
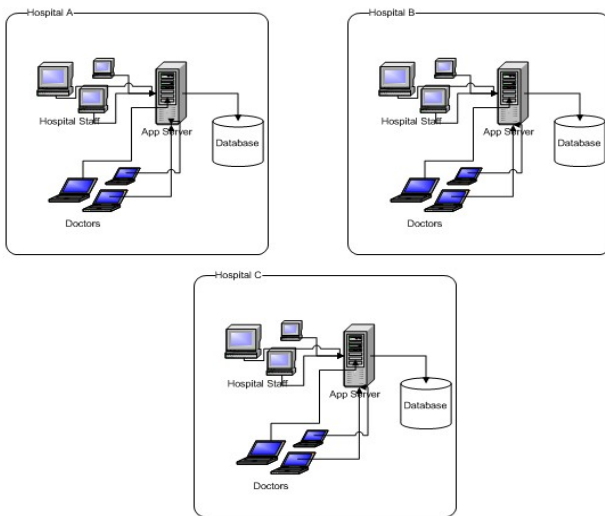

Figure 2.1. Individual HIS systems

2.2. High Construction and Maintenance Cost

A whole information system setup cost usually takes the hardware (equipments including servers and client computers) cost, software development, testing and maintenance cost in account. Current independent standalone HIS systems are very much expensive to setup and just to facilitate specific hospitals of specific districts/towns. Government of all 3rd world countries bears the burden of these independent standalone systems; although this money can be invested on improvement of healthcare services.
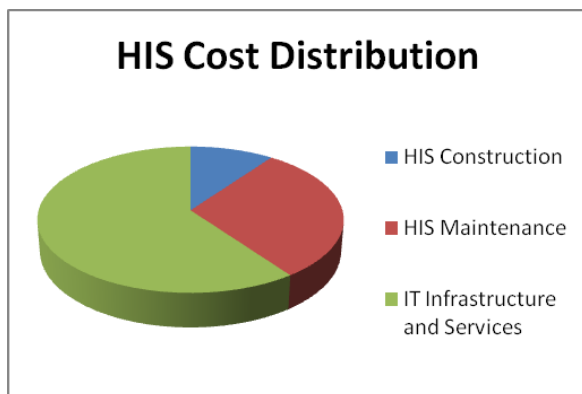

Figure 2.2. HIS Cost Distribution

2.3. Management, Upgrades and Maintenance

Setting up an information system has never been a big issue; however managing, upgrading and maintaining the information system have always been a big concern. Existing independent standalone HIS systems are hard to manage, upgrade and maintain; as for different hospitals in different districts/towns, separate management and maintenance is required.

However, management and maintenance process requires continuous investment including technical skills, proper users and experts. Upgrading the current information system has also been a big issue as the user needs/requirements are changing with time to time. This is same in hospitals as different hospitals produce different individual needs/requirements for upgrading the current HIS system. The work regarding HIS technical services is carried out in [2].
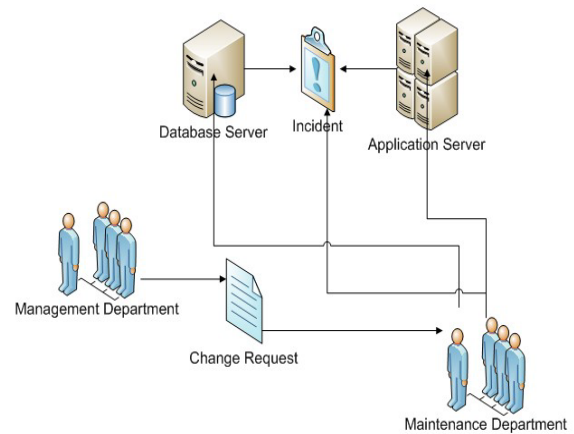

Figure 2.3. Management and maintenance resources
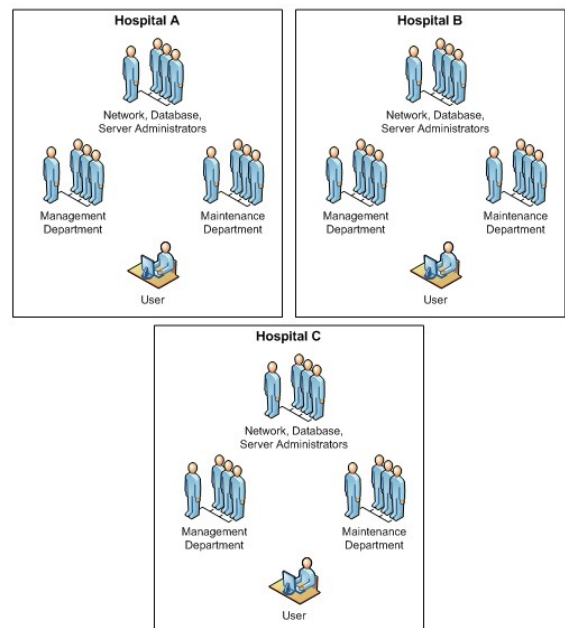
2.4. Resources Wastage

Figure 2.4. Resource wastage

As existing independent standalone HIS systems serve for specific hospitals, there is a lot of wastage of resources. There is separate management and maintenance

department in each hospital including separate network administrators, database administrators and server administrators.

3. Cloud Computing

Cloud computing remains the focusing area since past few years. Cloud computing is basically a network (internet) based innovative model and is referred as platforms, infrastructure and software sold as a service. The main objective or goral of cloud computing is to reduce the infrastructure cost burden from the organizations. In addition to this, it offers organizations better performance, security and less maintenance cost.

Depending on the definition described above, cloud computing has the three types as illustrated in figure.
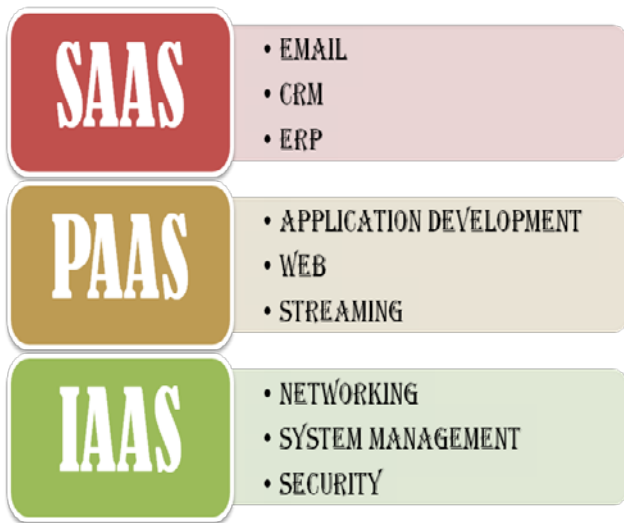

Figure 3.1. Cloud computing types

Cloud computing is being promoted by many of the large companies. In cloud computing a program or application can be run on many computers. Cloud has become the essential necessity to survive in the market, that's the reason for most of the companies to move towards the cloud. In [3,4,5] an extended work is carried out.
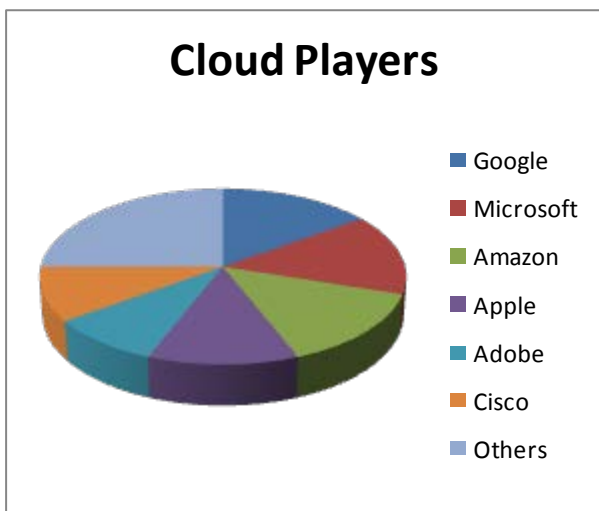

Figure 3.2. The cloud players

3.1. Cloud Computing in Medical Aspects

Cloud computing is growing in almost every field including healthcare services providing a new and better way to incorporate the foregoing problems. Some related research work is as under:

1. In [6], the cloud computing model is proposed to share the critical disease and critical cases information among the doctors of the different countries to improve the treatment.

2. Moreover the work in [7] is related about the cloud computing in medical aspects.
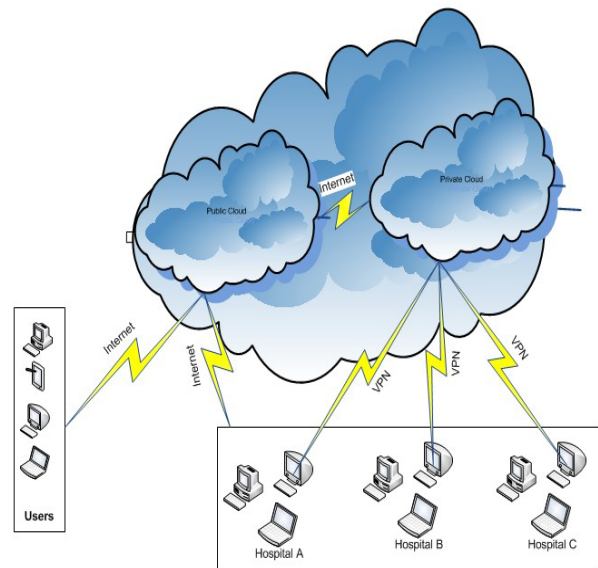
4. Proposed New Cloud Computing Solution

Figure 4.1. Cloud based HIS

Our proposed new cloud computing solution is hybrid cloud deployment model. Hybrid cloud model contains the Private cloud which facilitates the hospitals of the different districts/towns to manage the important information regarding patient's medical history, laboratory reports, some critical diseases/cases, treatment/ prescription details etc. On the other hand hybrid cloud model also contains public cloud to facilitate some normal management (such as staff) and also facilitates the outside users for appointment and viewing laboratory reports etc.

5. Conclusion

We have proposed a new cloud computing solution for the government hospitals of 3rd world countries to better access patient's medical information. Cloud based HIS facilitates the experienced doctors to better diagnose the patients. Cloud computing solution offers major practical advantages such as reduced construction, maintenance and up gradation cost. The security risk can be removed by deploying hybrid cloud model. The proposed model is for government hospitals of 3rd world countries; however it can also be adopted by community hospitals to save the cost issues and spent that amount of money in improvement of other healthcare services.

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