Cloud Computing System for Reciprocation of Images on HIS

Nanda Gopal Reddy, B.V. Ramana Murthy

Abstract: The Hospital Management Informatics Systems (HMIS) in current sectors are assimilated with digital information system which is intended to meet the imperative needs of hospital management systems with health care records of the patients which are modernized with reformed self-reliant systems running on cloud computing which is a organized system for retainment of information system. In the prior domain sector of hospital management system, the information integrated is of centralized system where the autonomous hospital were incapable to maintain the enormous cost raised for maintaining the resources and where incompetent to meet the patient's requisite. In this suggested scenario through a cloud based model the patients and the doctors are benefited with varied choices of examination in different departments and where the information is distributive and analysis of patient's records with doctors from different departments can be suggest and examine the patient record with experts. We proposed a effective solution for storing, analyzing and transmitting the image data thru Customized Cloud called ApolloOne.

Keywords: Medical Image, Cloud Computing, Hospital Management System.

INTRODUCTION

Cloud computing is nothing but a knowledge based paradigm that intended to provide the ultimate uses the option of ubiquitous access of information anywhere with less effort through internet. The pooled resources and software are organized persistently in a cloud system, where the ultimate user can approach and connect with the cloud through a minimum knowledge.

In additionally the cloud system provides the solutions for recurring needs of information technology and industrial demands for segregation of information render one domain. The cloud system shows new emerging solutions for all the requirements of IT through internet revolution which is also increased productivity drastically.

Cloud based systems emphasis on pay and uses the utility which brought change in the information technology.

The cloud system contribute to the constant needs of information system without any basic investment in the current domain and provides the high-end distributive information across global net fulfilling the needs of ultimate patients and doctors in hospital management system. In Figure 1 the layers of different cloud are discussed.

CONFLICTS IN TRADITIONAL HOSPITAL SYSTEMS

Insufficient Utilities for Sharing the Data in Various Domains

In the prior HIS system the various autonomous hospitals equipped with bulk number of medical equipments such as Ultrasound, CT, radiology, equipmentetc. Generating huge number of storage data and encoding methods eventually the information is producing duplication of data and disuse of various resource. The system based Patient Record (PR) generated in varied hospitals lacks uniformity in different departments.

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Rise in Cost for Individualistic Composition

It is immense a weary task for all the hospital to maintain autonomous system setup and it is a cumbersome task to maintain all the hardware and software management requirements in the individual (respective) hospitals. The construction of (PACS) picture archive and communication systems is challenging task in HIS which maximizes the expenditure and budget.

Problematic Maintenance and Management Techniques

Maintaining a autonomous HIS system in various hospitals raises expenditure eventually provoke misuse of software and technical risks in upgrading separately each HIS system Individually in respective hospitals. In the current situation financing to the constant needs of HIS is burdensome and unmanageable task.
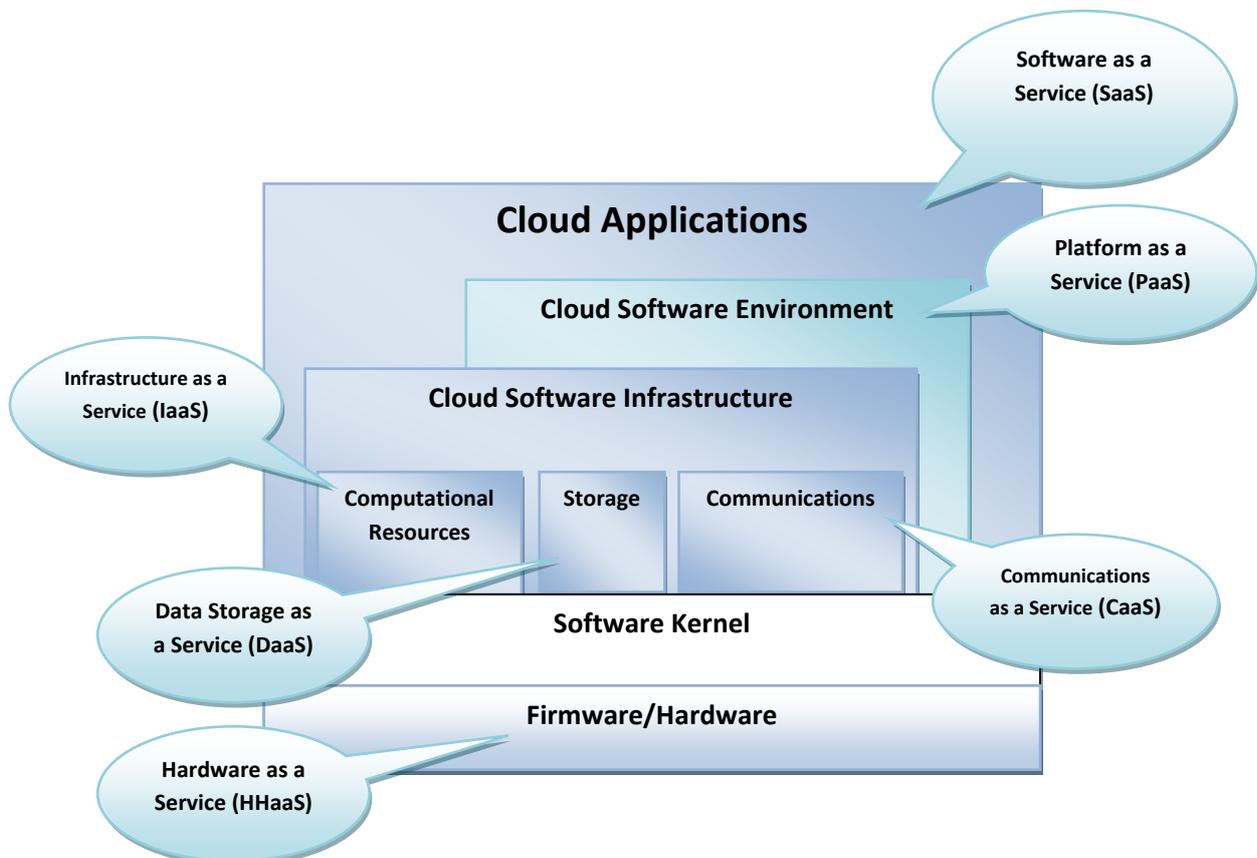

Fig. 1: Architecture Layers
Cloud Computing Captivating More Towards Healthcare System(HIS)

The main reason for the cloud computing captivating towards healthcare system is due to the large number of healthcare providers and insurance companies' .in the current scenario the ultimate patients can use diverse platform and numerous insurance companies for several insurances related to vision, dental etc.The raise in heterogeneous options for maintaining EMR of the patients raised the options of sharing information between healthcare providers which increased the ubiquitous access through internet anywhere through cloud system. These EMR are also named as EHR (electronic health record) which are efficiently maintained with minimal cost in cloud system.

CLOUD BASED CLASSIFICATION OF HEALTH CARE DOMAINS

The classification of the healthcare cloud is depended on cloud service model and cloud deployment models which are branched into three distinctive layers. In Figure 2 Virtual Models of ApolloOne are discussed.

Applications in the Cloud (Software as a Services-SaaS)

The indicated layer provides an options to the ultimate user with a minimal knowledge for Accessing the information across the web and efficient risk free protection is enabled by the SaaS to the healthcare consumers.

Platforms in the Cloud (Platform as a Service-PaaS)

The indicated layer provides the user the potentiality to maintain two level protection security and privacy and gives the various options to maintain high end security by following the authentication and control policy defined by cloud.
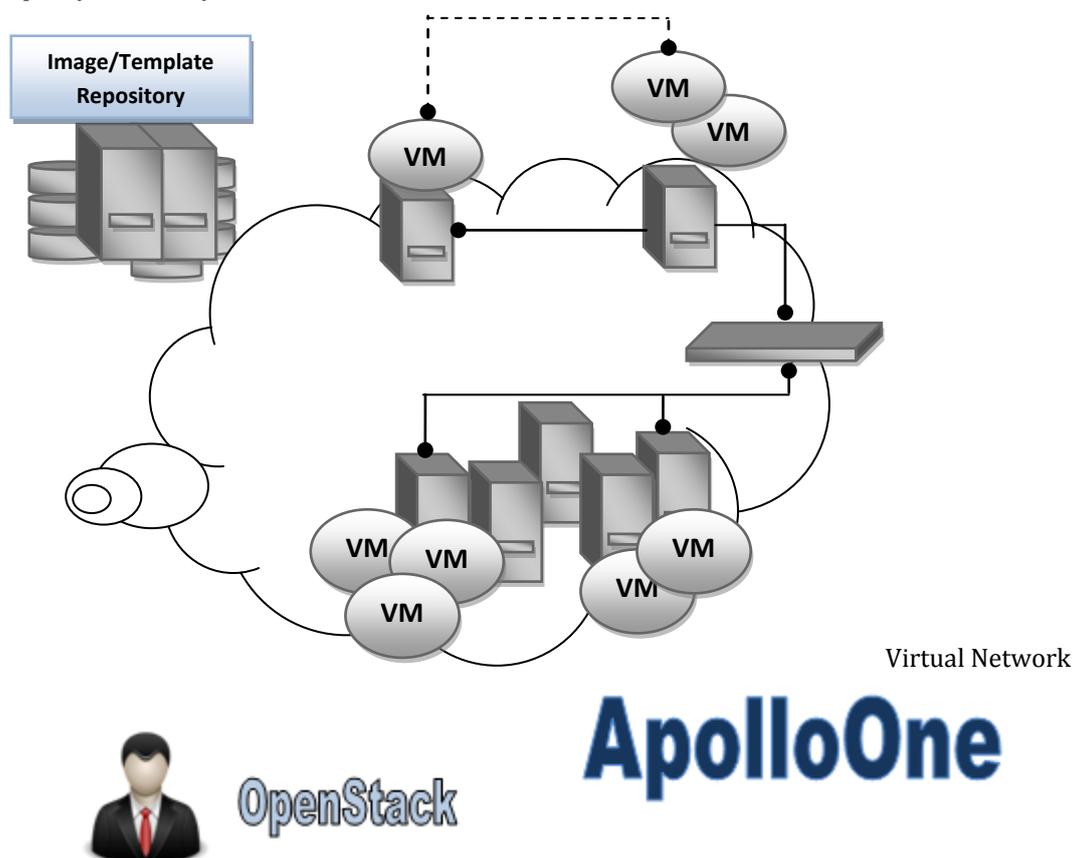

Fig. 2: Virtual Model of ApolloOne

Infrastructure in the Cloud (IAAS)

In this layer the users are equipped with fundamental basic resources where there has an option to redistribute or deploy and run a limited software application where the deployment models are classified as follows in the healthcare cloud system

Private cloud: the private users have an option to deploy some applications by agreeing the security and privacy protection where only few of the third party clients can access.

Public Cloud: In this public cloud the security and privacy become the key concern where large number of general public or defined group can access the information and the risk of duplication of the data is more in the cloud system where every individual user is responsible for protecting patients record information

Community cloud: in this scenario the information is shared by respective community group by agreeing to the specified policy. Cloud computing platform ensures high end security to the healthcare cloud system where the user is given password privileges to access the data in different models of the cloud (private, community, public) these models shown in Figure 3.

With mutual agreement to the protection policies specified.

IMPROVEMENT / CUSTOMIZATION OF CLOUD

To achieve the results in an IaaS cloud computing Open source product in current domain is which is a enterprise standard to achieve and implement IaaS which makes the interoperability feature by giving conformability to various hardware and software compositions. The main key characteristics of OneApollo product are to provide integration, scalability portability etc with key priority given to the cluster management with Zen, kvetch features. It provides multiple options to the user to access multiple clouds in secure and high end security policy mentioned by IaaS.

Fig3: Client Server based ApolloOne

This product comes in with toolkit where the end users can enable the service provided by OneApollo system. Many of the industrial companies such as GE, Philips and Telecom market adopted the OneApolloProduct which is implemented through virtual networking where the user are provided with a virtual machine instances through which the user can perform various operations.

OneApollo is an adjustable support system providing solutions to different individual user and clustered groups where the accounts are well synchronized and maintained by implementing various security and privacy permission. These are the following characteristics where OneApollo compels:

Fig. 4: Resource Handling & Distribution

- Efficient Management of storage capacity issues and grouping of networks dynamical in multi threaded distributive system.
- Uninterrupted execution of Virtual Machines by allocating the required resources.
- A emphatic groundwork for management of workload and resources are ensured
- Efficient maintenance of information and accounting policies.
- Good implementation techniques in synchronizing the Virtual Machines images
- Good security policy
- Dynamic access from remote location.
- Good organized public cloud servers.

In this proposed system it has been designed in such way that patients / users can upload, send, storing and retrieving the images of MRI and CT scanned documents through ApolloOne Hospital Management System and Department of Healthcare will take the responsibility to establish the secure connection between patient's records to HMS? To improve the efficiency of existing models it is advised to add a network security module to fulfill the needs of cloud based allotment of software, hardware and any other infrastructure. With this technique it will reduce the complexities involved in load balancing and thus enhance the file sharing speed within or outside of the hospital. These steps lead to reduce the cost of the establishment of infrastructure and increase the hospital efficiency.

In India commonly the scanned images are sending by different modes of transport like manual, mail or sometimes with FTP which takes more time in streamlining at both ends, In figure 4 handling and distribution of resource are discussed. Sometimes this type of transformation fails, to overcome all these issues Cloud based hospital Image Management system with continuous process with low cost is called as ApolloOne.

Table 1: Comparative study with other Service providers

	Amazon EC2 AWS	Microsoft Azure	IBM ProCloud	Galaxy Cloud	Google Cloud	OneApollo
File Capacity	5 GB	15 GB	2 GB	No	No Limit	7 GB
Free Upgrade	Yes	No	Yes	No	No	Yes
File encryption	256 bit AES	128 bit AES	256 bit AES	256 bit AES	256 bit AES	256 bit AES
Support any file format	No	Yes	Yes	No	Yes	Yes
Elapsed Time	12.6min	9.6 min	8.6 min	16 min	~4 min	6 min
Single file upload Time	35s	42s	10s	52s	~20s	22s
Speed Up ratio	20.0X	16.5X	15.1X	36.4X	12.0X	12.5X
Resource	Genotyping	Genomes	Annotation	LSGA	BLAST	Genome
Type	Pipeline	Pipeline	Application	Platform	Database	Database
Sync Ration	1:20	1:12	1:13	1:20	1:8	1:6
Mobile support	No	No	Yes	No	Yes	Yes
File share to another APP	No	No	No	No	Yes	Yes
Image backup	No	Yes	Yes	No	Yes	Yes
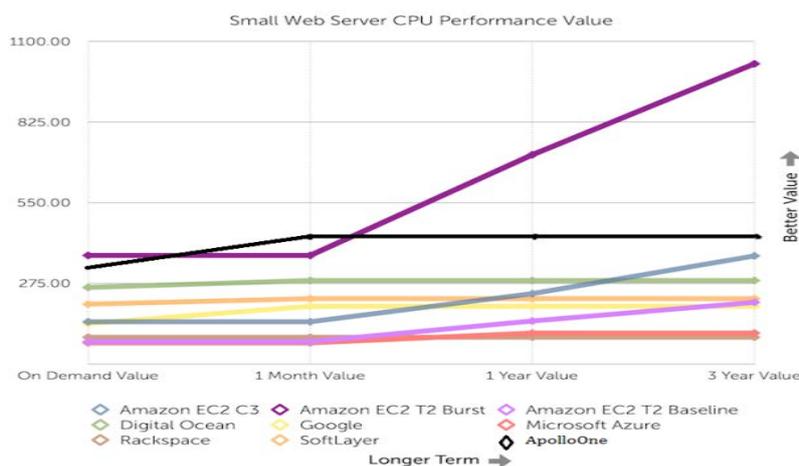
In ApolloOne Customized / Enhanced cloud there are so many things that are improved than existing private clouds like File Capacity, File Encryption, Supporting formats, synchronization, size of the file and security issues like corrupted image and morphed image. All the parameters are tested under different locations with deferent files sizes with different image formats. The comparative study of the ApolloOne with other customized clouds is shown in the table 1. The Performance of the ApolloOne with other clouds is varied with the time, it will give maximum throughput when it runs for a long time and those results are clearly shown in the graph.

CONCLUSION

The traditional public clouds provide varieties of functionalities still there are some gaps in fulfilling the healthcare domain requirements like storing, transmitting and retrieving medical images with less time intervals. The main concerns are size, type of the file, security issues like encryption and authentication. Here ApolloOne (Customized / enhanced) cloud is a solution for all these issues. ApolloOne is compared with all existing private cloud providers and the results are clearly shows that it has completely dominated in many aspects of parameters like File size (FS), File Type (FT), Encryption Methods (E), Noise Ratio (NR), Speed (S) and Time Complexity (TC). In most of aspects ApolloOne clearly dominates Amazon EC2, Microsoft Azure, IBM ProCloud, and Galaxy Cloud.

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