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Enhanced Research on Remote Health Centre Using Hybrid Cloud

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ABSTRACT: Nowadays, in developing countries like India health care in remote place became a challenging task. This happens due to the insufficient hospitals, physicians and facilities in the rural area. As livelihood is more worrying than ever, there are added the cases of new diseases. The lack of hospitals in rural area and the fast paced life in urban areas gives rise to tele-medicine. Cloud computing is a designed pattern for Intellectual technology. In real-time scenario implementation, cloud technique can be collaborated with communication devices for the purpose of public orientations. A cloud based Telemedicine provides a new way for easy and worldwide access to medical data. In addition to it, it also provides a way to communicate with specialist who is not available in the remote areas. The use of mobile phones has also been increased in the rural areas. These technologies development can be utilised for the further more advancement in tele-medicine. This paper makes use of hybrid computing. The open source framework with hybrid cloud is for providing quick access to remote area in the case of emergency. Thus an application that combines cloud computing, mobile phones and a tele-medicine facility is presented here. Intelligent layer performance is framed with CaaS Layer for a utility architecture.

KEYWORDS: Cloud Computing, Mobile Devices, Tele-Medicine, Remote Health Care.

I. INTRODUCTION

Telemedicine system is one of the most important forces determining the future of healthcare industry. Telemedicine is still a baby chicken industry. Telemedicine refers to the utilization of telecommunication technology for medical diagnosis, treatment and patient care. It also can be described as the transfer of electronic medical data from one location to another. Today, a lot of the technical activity in the telemedicine industry consists of vendors integrating suites of components to create turnkey solutions for specific clinical settings .This system allows you to regularly monitor a patient's data without having to see them in person. Even though some of the systems have achieved astonishing clinical successes.

Telemedicine environment include hospital care management, remote teleconsulting , collaborative diagnosis and emergency situations handling. Different types of information need to be accessed by means of heterogeneous client devices in different communication environments in order to enable high quality continuous hygienic assistance delivery wherever and whenever needed. Telemedicine applications are a valid method to improve the quality of the delivered sanitary assistance.

Health center are dually need to be improvised in remote areas of developing countries. Thus Cloud which is already a multi-tentative rood in professional definition, it can used in multiple application focused on the purpose of secure storage and data privacy. Cloud computing is to provide cheap and efficient service to the mass and supports communication layer. This reduces infrastructure cost, data management cost, etc. platform as a service, communication as a service and also monitoring as a service. Collection of information from a remote and area and response correspondingly makes some issues. In recent times, most of the commercial applications are deployed in cloud. Cloud are of three types, public cloud which is mostly maintained by third parties, private cloud which is used

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for specific application and hybrid cloud which is a combination of both the above mentioned clouds. Existing advanced research in health center ropes into cloud access focusing developed areas or urban side.

II. MOTIVATION

A typical health center delivery process would involve a person visiting the doctor whenever he feels sick, which hesitates quick access. The primary challenges in such a delivery process are:

1) Access delay due to information: Initial symptoms of disease are often ignored thus making the disease more severe before the patient actually visits the doctor (Rather than the disease being treated at the very early stage, not requiring very competent medical experts).

2) Medical expert's limitations: With only a small number of competent medical experts available, at geographically remote locations directly approaching a good doctor, located mostly in urban areas, is often expensive.

This Socio-friendly health care management will be impact IT industries with almost immediate attention, devices like mobile phone can used with free messaging service. Since, the benefit from this case scenario will technically move quality to supreme establishment.

III. TELEMEDICINE USING CLOUD COMPUTING

Cloud is a subscription-based service where you can obtain networked storage space and computer resources. Most cloud computing infrastructures consist of services delivered through common centers and built on servers. The cloud makes it possible to access one's information from anywhere and at any time. While a traditional computer setup requires you to be in the same location as your data storage device, the cloud takes away that step.

The cloud computing is helpful in the places where they cannot afford same amount of hardware and storage space as a bigger organization. This removes the cost of purchasing and storing memory devices. By using cloud computing one can purchase more space for storage purposes. One should have internet connection in order to access the cloud. The cloud computing based services will be an on demand service whose cost will be based on the amount of usage only which offers a low cost. Cloud computing allows a distributed access to a number of location with ease. Fig.3.1 shows how telemedicine process works.

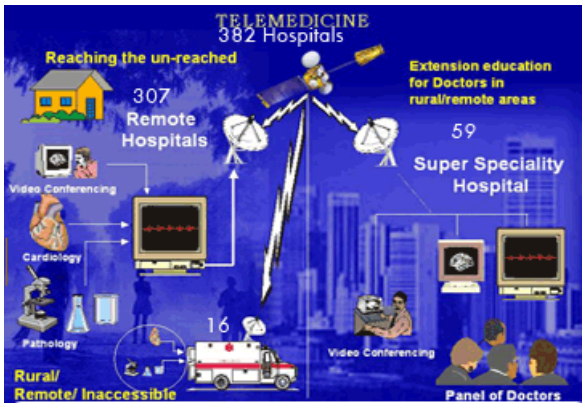

FIG 3.1 TELEMEDICINE WORKING SAMPLE

IV.CLOUD COMPUTING ARCHITECTURE

Cloud computing architecture consists of:

- Infrastructure as a Service (IaaS),

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- Platform as a Service (PaaS) and
- Software as a Service (SaaS)

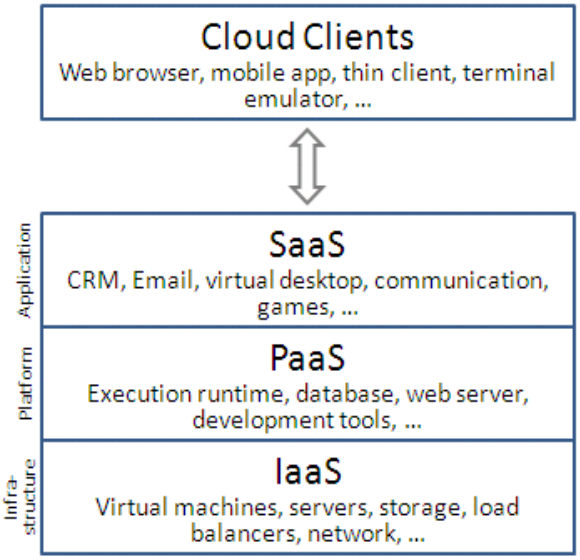

FIG 4.1 CLOUD COMPUTING ARCHITETURE

SOFTWARE AS A SERVICE (SaaS):

Software as a Service (SaaS) can be defined as the software that is deployed over the internet. With SaaS, a provider licenses an application to customers either as a service on demand, through a subscription, in a "pay-as-you-go" model, or (increasingly) at no charge when there is opportunity to generate revenue from streams other than the user, such as from advertisement or user list sales [9].

SaaS work well in:

- Application that have a significant need for web or mobile access.
- Software that is only to be used for a short term need.
- Software where demand strikes significantly.

SaaS may not work well in:

- Application where extremely fast processing of real time data is needed.
- Applications where legislation or other regulation does not permit data being hosted externally.
- Application where an existing on-premise solution fulfills all of the organization's need.

PLATFORM AS A SERVICE (PaaS):

Platform as a service (PaaS) brings the benefits that SaaS bought for application, but over the software development world. PaaScan be defined as a computing platform that allows the creation of web applications quickly and easily and without the complexity of buying and maintaining the software and infrastructure underneath it [9].PaaS is analogous to SaaS except that, rather than being software delivered over the web, it is a platform for the creation of software, delivered over the web.

PaaS may not work well in:

- PaaS is especially useful in any situation where multiple developers will be working on a development project or where other external parties need to interact with the development process.
- PaaS is useful where developers wish to automate testing and deployment services.

PaaS may not work well in:

- Application that needs to be highly portable in terms of where it is hosted.
- When Application performance requires customization of the underlying hardware and software.

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- Where proprietary languages or approaches would impact on the development process

INFRASTRUCTURE AS A SERVICE (IaaS):

Infrastructure as a Service (IaaS) is a way of delivering Cloud Computing infrastructure – servers, storage, network and operating systems – as an on-demand service. Rather than purchasing servers, software, datacenter space or network equipment, clients instead buy those resources as a fully outsourced service on demand [9].

Generally IaaS can be obtained as public or private infrastructure or a combination of the two. "Public cloud" is considered infrastructure that consists of shared resources, deployed on a self-service basis over the Internet.

IaaS is a best option :

- Where demand is very volatile.
- For new organizations without capital to invest in hardware.
- Where the organization is growing rapidly and scaling hardware would be problematic.
- Where the pressure on the organization to limit capital expenditure and to move to operating expenditure.
- For specific line of business, trial or temporary infrastructural needs.

IaaS may not be a best option:

- Where regulatory compliance makes the offshoring or outsourcing of data storage and processing difficult
- Where the highest levels of performance are required, and on-premise or dedicated hosted infrastructure has the capacity to meet the organization's needs

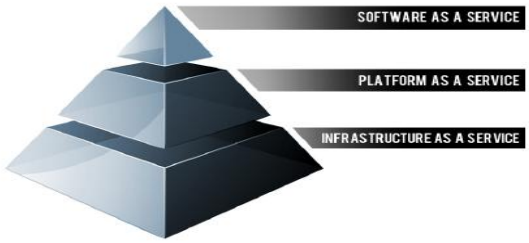

FIG 4.2 SERVICE LAYERS OF CLOUD COMPUTING

In this paper we make use of another service layer of cloud namely, Communication as a Service(Caas) which is explained in detail below:

IV. COMMUNICATION AS A SERVICE (CaaS):

Communications as a Service (CaaS) is an outsourced enterprise communications solution that can be leased from a single vendor. Such communications can include voice over IP (VoIP or Internet telephony), instant messaging (IM), collaboration and videoconference applications using fixed and mobile devices [8]. CaaS has evolved along the same lines as Software as a Service (SaaS).

The CaaS vendor is responsible for all hardware and software management and offers guaranteed Quality of Service (QoS). CaaS allows businesses to selectively deploy communications devices and modes on a pay-as-you-go, as-needed basis. This approach eliminates the large capital investment and ongoing overhead for a system whose capacity may often exceed or fall short of current demand.

CaaS offers flexibility and expandability that small and medium-sized business might not otherwise afford, allowing for the addition of devices, modes or coverage on demand. The network capacity and feature set can be changed from day to day if necessary so that functionality keeps pace with demand and resources are not wasted. There is no risk of the system becoming obsolete and requiring periodic major upgrades or replacement.

CaaS builds on the basic foundation of Software as a Service (SaaS), with some requirements unique to communications applications.

Factors for choosing CaaS:

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- Initial cost
- Recurring cost
- Functionality
- Connectivity
- Security
- Administration
- Survivability
- Business continuance/ disaster recovery
- Investment in existing equipment

Advantages of CaaS:

- Generally CaaS solutions require little or no capital investment
- CaaS generally charge on a per use or per user basis which provides a predictable pricing model for companies
- The ability to avoid lock-in to antiquated communications technology
- Flexibility to add features and services as needed as business requirement change.

Today, CaaS applications tend to provide connection through two methods:

1) The CaaS application is used to initiate calls between two telephones that are on a traditional wireless telephone network.
2) Proprietary soft phone applications are installed on personal computers when user signup for a service. Users of the application can place calls between each other over the IP network.

As high speed wireless networks become more common place, CaaS applications will evolve to embrace the increased flexibility and performance that emerges. These emerging high-speed wireless networks and the mobile devices that use them dramatically increase the potential for CaaS applications created specifically for mobile broadband users. Fig 4.3 shows the CaaS layer in cloud computing

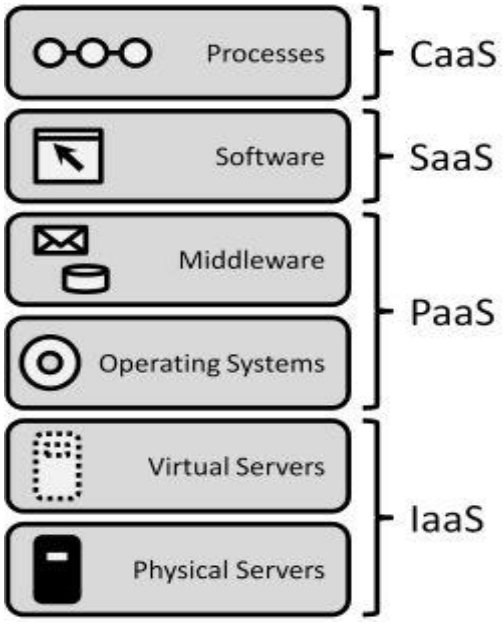

FIG 4.3 CAAS SERVICE IN CLOUD

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Types of cloud computing:

Cloud computing is offered in four different forms:

Public clouds – are held by a company selling cloud services to the general public. A cloud is called a 'Public cloud' when the services are rendered over a network that is open for public use. Technically there may be little or no difference between public and private cloud architecture, however, security consideration may be substantially different for services (applications, storage, and other resources) that are made available by a service provider for a public audience and when communication is effected over a non-trusted network. Generally, public cloud service providers like Amazon AWS, Microsoft and Google own and operate the infrastructure and offer access only via Internet (direct connectivity is not offered)

Private clouds – are owned by a single organization and are being used only in that organization.Private cloud is cloud infrastructure operated solely for single organization, whether managed internally or by a third-party and hosted internally or externally. Undertaking a private cloud project requires a significant level and degree of engagement to virtualize the business environment, and requires the organization to reevaluate decisions about existing resources. When done right, it can improve business, but every step in the project raises security issues that must be addressed to prevent serious vulnerabilities.They have attracted criticism because users "still have to buy, build, and manage them" and thus do not benefit from less hands-on management, essentially "[lacking] the economic model that makes cloud computing such an intriguing concept".Fig .4.4 shows the various types of cloud

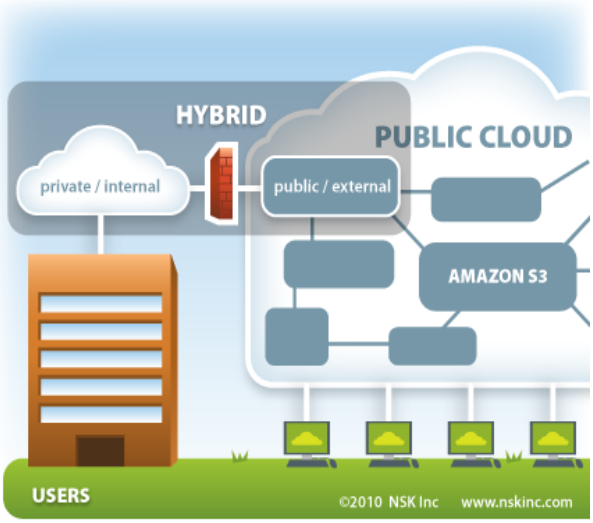

FIG 4.4 TYPES OF CLOUD

Community clouds – Belonging to several organizations and allowing access only to those concerned for certain actions.
Hybrid clouds – a composition of two or more type of clouds (private, public or community) that remain unique entities but are linked by standard technologies that enable portability of applications. For medical applications, the best choice of a model is the private one for reasons of security and data privacy.

In this paper we are using the hybrid cloud which is a combination of both public and private clouds. By making use of this hybrid it is even more easy to access patient's details and also to locate the nearby hospitals.

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V. PROPOSED SYSYTEM

In the present health scenario there are lots of telemedicine applications for patient monitoring. But our application is based on cloud computing. We present a cloud computing based remote health center management in which we mainly focusses on rural areas. People in rural areas will be out of reach from the medical advancements. The people from rural area may not get all the facilities which is being experienced by an urban individual. Thus to provide a solution for this case a data center is maintained in each village.

This data center will have the medical history of each and every individual living in that village. These details will be stored in a public cloud which can be accessed from anywhere across the globe. The data center will have the list of details of the available specialist doctors from various hospitals. Once when a mishap occurs the victim can directly make a call to the data center. This data center will first collect the details of the victim and the type of mishap. According to the details gained, the data center will allow the victim to communicate to any one of the specialist doctor available. The medical history of that victim will be shared with the specialist doctor who is going to direct the victim. The victim may communicate to the doctor through a call or through a video call based on the type of injury. The specialist doctor will give directions for first aid to the victim. Within which the data center will search for the nearest hospital with the required facilities and the victim will be routed to that particular hospital. If at all the hospital with the required facilities is far from the place of mishap a local doctor will be guided by the specialist doctor for further more treatments until the victim reaches the targeted hospital. Fig 5.1 shows the internet architecture with telemedicine.

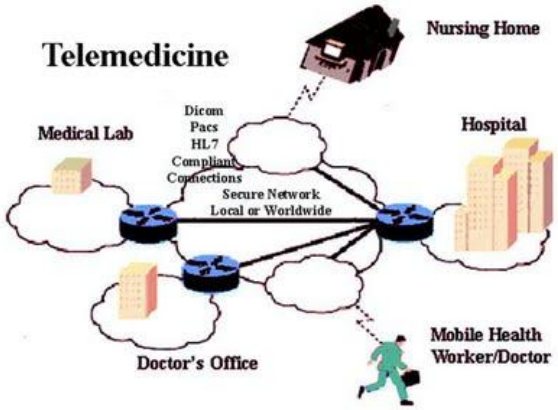

FIG 5.1 TELEMEDICINE WITH INTERNET ARCHITECTURE

In addition to it, if there is more blood loss in an accident any third person can easily search for the particular blood group from the nearest hospitals with the help of the data center. Immediately after requesting the mentioned blood group will be delivered to the desired hospital, this is done by accessing hybrid cloud of interconnected blood banks.By providing this kind of health care the probability of life risk can be reduced terribly. One can get an expert advice from their locality. As the details and the medical history of each individual is being maintained in the health center it is easy for treating a victim by any doctor.

The main advantage is that routing is done to the nearby hospital with all the required facilities. Thus the risk of one's life is reduced to some extent. The treatment can be given to any number of people at any time. More number of doctors will be present online so there will be no chance for the lack of expert doctors. As an expert advice is taken before reaching the desired hospital the chances for risk is reduced. One can contact the data center from any remote area irrespective of the signal. The process of first aid and routing is faster when compared to the existing processes. Patients can view their health records and prescriptions on their mobile phones on a request basis. This architecture is even more flexible than the all other architectures. As this allows remote access to data it is easy for a doctor for future treatment validation. Fig 5.2 shows how the service flow takes place between user and service provider.

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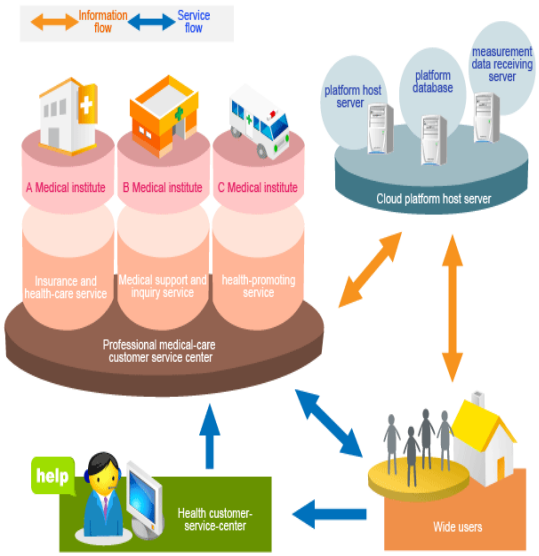

FIG 5.2 SERVICE FLOW BETWEEN USER AND A SERVICE PROVIDER

Nowadays the usage of paper is reduced everywhere and all the documents have got its digital form to make the access easy. Being a part of such a fast pacing community a person cannot carry all his medical documents wherever he goes. Instead as all the patient's details have already been stored in the cloud it is easy for any individual to access and download his own medical reports from the cloud in the form of a "pdf" document from anywhere and at any time. To download such a document an individual needs to be authenticated. Only if the authentication succeeds they can download the medical report.

This service plays a major role when a person needs to undergo a medical checkup out of his home town. He can easily get his old medical summary from cloud by a simple way of authentication.

Another service provided is blood donor service. Apart from getting help from blood banks request can also be sent to the interested donors in the case of emergency. Any interested candidate can register online for blood donation by just specifying their basic details along with their blood group. For rural areas, a person from data center is sent to take a list of willing donors. All these details are stored in cloud for future use. In the case of emergency, a message/email will be sent to all the registered candidates of respective blood group to inform the need of blood in a particular hospital.

VI. CONCLUSION

Here we have presented a concept of using Hybrid cloud to improve the efficiency of health care inremote areas along with the help of mobile phone (telecommunication) technology. This can complement health care services such as automated diagnosis and telemedicine services. We haveproposed that by just making a request through the mobile phone one can access the health care facilities that are far away from them. The data center plays a major role in our paper. The medical history each individual from a village is gathered and saved for future treatments. This makes the treatments even easier and also reduces the risk of life.

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