Survey of Cloud Computing in Healthcare Sector

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Abstract: Today the volume of healthcare data generated increased rapidly because of the number of patients in each hospital increasing. These data are most important for decision making and delivering the best care for patients. Healthcare providers are now faced with collecting, managing, storing and securing huge amounts of sensitive protected health information. As a result, an increasing number of healthcare organizations are turning to cloud based services. Cloud computing offers a viable, secure alternative to premise based healthcare solutions. The infrastructure of Cloud is characterized by a high volume storage and a high throughput. The privacy and security are the two most important concerns in cloud-based healthcare services. Healthcare organization should have electronic medical records in order to use the cloud infrastructure. This paper surveys the challenges of cloud in healthcare and benefits of cloud techniques in health care industries.

Keywords— Healthcare providers, Cloud Computing, Security, Privacy

I. INTRODUCTION

In day to day life, the applications of cloud computing are increasing rapidly. cloud computing is being used in the health care industry also. according to the national institute of standards and technology (nist), cloud computing can serve as a model that permits a set of configurable computing resources in sharing convenient and on-demand network access that are not usually provided in regular healthcare environments [2]. as the evolution of cloud computing in health care is occurring at a rapid rate in recent times, a major part of the healthcare services to move onto the cloud and

in the healthcare sector, the resources of information technology are significantly underutilized; particularly in areas of operational efficiency. cloud computing is one of the modern revolutionary technologies in the world [6]. most healthcare sector still relies on paper based medical records, thus limiting collaboration and coordination between patients and physicians. cloud computing is an architectural model that employs many of the components used in data centers around the world today in a more flexible, responsive, and efficient way [10]. thereby providing an efficient and cost effective healthcare service to the people all around the globe.

There are wide varieties of health related data sets that play a critical role in the health information systems and clinical decision support systems registries [9].

The 21st century Healthcare Information Technology (HIT) has created the ability to electronically store, maintain, and move data across the world in a matter of seconds and has the potential to provide healthcare with tremendous increasing productivity and quality of services. It permits each provider to have his own database of patients' Electronic Medical Records (EMRs) [8]. Cloud computing has both the extensive network access and resource pooling to support big data sets from Electronic Healthcare Records (EHR).

Today many doctors and hospitals are moving towards these clouds in order to provide better healthcare services to their patients. In cloud computing, the data is stored with the help of database server. Suppose there is an emergency in rural areas then the patient can move from one place to another place for getting better treatment. Before the new doctor starts the treatment for the patient, they need the history of the patient to treat them in a new way. All the information about the patient can be available to the new doctor with the help of this cloud computing system [9]. If the patient's condition is very critical and the doctors are not available due to some reasons then the patient can go to another doctor. With the help of cloud computing system, the new doctor can use the past history of that patient and they can treat in a better way.

1.1 Cloud Computing Basics

Cloud computing allows companies to use a computing resource such as a virtual machine, storage or an application, as a utility rather than having to build and maintain computing infrastructures in house. Cloud computing is a universal term for the delivery of hosted services over the Internet [7]. Cloud computing has a number of attractive benefits for businesses and end users. The main benefits of cloud computing are:

- *Self-service*: End users can use the computer resources for almost any type of workload on demand.
- *Elasticity:* Companies can scale up as computing needs increase and scale down again as demands decrease. It reduces the need for huge investments in local infrastructure which may or may not remain active.
- *Pay per use:* Compute resources are measured at a granular level, allowing users to pay only for the resources and workloads they use.

Cloud-based services are steadily becoming very large adopted by healthcare organizations. The accelerating migration to cloud computing represents a change for the way the healthcare industry sources its information technology.
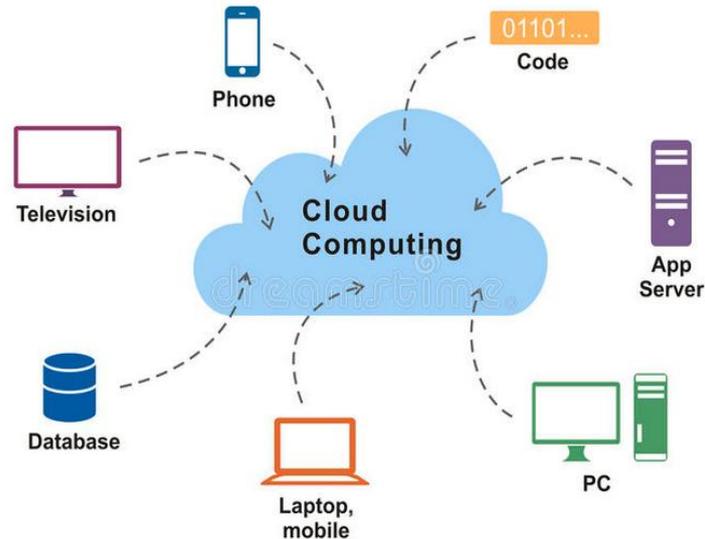

Figure 1: Cloud computing overview

1.2 Cloud computing deployment models

Cloud computing services can be categorized into three types such as public, private and hybrid services. In the public cloud services, third-party providers distribute the cloud service over the internet. Public cloud services are sold on demand, typically by the minute or hour. Customers only pay for the CPU cycles, storage or bandwidth they consume. Leading public cloud providers include Amazon Web Services (AWS), Microsoft Azure, IBM Soft Layer and Google Compute Engine [1].

Private cloud services are delivered from a business data center to internal users. This model offers versatility and convenience while preserving the management, control, and security common to local data centers. Through the IT chargeback, the internal users may or may not be billed for services.

- Hybrid cloud is a combination of public cloud services and private cloud. Companies can run mission-critical workloads or sensitive applications on the private cloud while using the public cloud for bursting workloads that must scale on

1.3 Cloud computing service categories

Although cloud computing has changed over time, it has been divided into three broad service categories: Infrastructure as a service (IaaS), Platform as a service (PaaS) and Software as a service (SaaS).

IaaS providers offer a virtual server instance, storage, and Application Program Interfaces through which the users can transfer their workloads into a virtual machine. Each user has an allocated storage capacity. They can start, stop, access and configure the Virtual Machine and storage as preferred. IaaS providers offer small, medium, large, extra-large and memory- or compute-optimized instances, in addition to customized instances, for various workload needs.

PaaS contains set of software development and deployment technologies. People can utilize these services either to host or to develop and test their applications. Users access these tools over the internet using Application Programming Interfaces, web portals or gateway software. PaaS is used for common software development. Common PaaS providers include salesforce.com, force.com, Google App Engine and AWS Elastic Beanstalk.

SaaS providers distribute software applications over the internet; these applications are often called web services. In this model, the client can use various software applications without having to install them on their machines. These services like e-mail, facebook, and google docs are accessible from any device having a web browser. Microsoft Office 365 is a SaaS offering for productivity software and email services. Users can access SaaS applications and services from any location using a computer or mobile device that has internet access.

II. REVIEW OF LITERATURE

Rana et al. [11], proposed the system that focuses on the collection of patient's information is very important health parameters that are used to generate alert to doctors so that the doctors can take immediate action in case of emergencies. The collected patient data is stored in Cloud so that data can be accessed via the Internet from anywhere anytime. Cloud computing is the use of computing resources that are delivered as a service over the network. Cloud has the abundant processing power, a large amount of storage which can be scaled according to application needs. The proposed systems break the architecture into four parts such as healthcare sensing, securing and privacy, middle ware, and database and front-end application. Each of these parts can be treated as separate systems and each part does form part of the healthcare monitoring system. The advantage of the proposed system is to send the emergency SMS alert to the authorized person. The disadvantage of this system is no accurate measurements of environmental parameters and no efficient use of energy for the remote site, mobile devices, and vehicle-based data.

Sapna Tyagi et al. [2], proposed an IoT-Cloud enabled healthcare system. In this framework, the medical information can be safely transferred, with the consent of the patients and other health actors. The proposed system to build a network among all the entities participating in healthcare which certainly leads to the improvement in communication and collaboration among these entities providing better care and services to the patients. The proposed framework enabling technology for many healthcare providers to face many challenges such as rising healthcare delivery costs, information sharing, shortage of healthcare professionals better care and enhanced services for the patients. The advantage of this system is Monitoring patients health in every 5 minutes. The disadvantage of this system just monitors while emergency no any indications and internal attacker.

Jayashree Agarkhed et al. [3], proposed a framework called Cloud Assisted Mobile Health Monitoring System (CAM) is to ensure the protection of the included gatherings and their information. The outsourcing unscrambling strategy and a recently proposed key private intermediary re-encryption are adjusted to move the computational intricacy of the included gatherings to the cloud without trading off customer's security and administration supplier's licensed innovation. At long last, the security and execution investigation exhibits the viability of the proposed outline. This framework demonstrating secure and execution investigation shows the viability in Cloud Computing environment. The problem in this framework is addressing security and privacy.

K.Samunnisa et al. [4], proposed secure and privacy preserving sharp computing system, called CAM. In this structure, every restorative client in the crisis can accomplish the client driven privacy access control to permit just those qualified assistants to take part in the intelligent computing to adjust the high dependability of the procedure and minimizing privacy exposure in the m-Human services crisis. The CAM system present an effective client driven privacy access control which is based on an attribute-based access control and another privacy-preserving scalar product computation (PPSPC) procedure and permits a restorative client to choose who can partake in the crafty computing to help with processing his staggering data. The proposed approach has the ability to set clear isolation of report access rights for his touch data. Utilizing optical character Acknowledgment to store the patient points of interest it makes more secure. The benefit of the framework is the capacity overhead is straight with the quantity of outsourced social insurance data documents while the correspondence overhead can be considered as steady per data demand. The disadvantage of this framework is complicated where users have a random medical request and diverse privacy preservation requirements.

Neha Dubey et. al. [5], proposed a method is to provide a point of view on how cloud computing is applicable in healthcare and set some of the key principles that healthcare industry need to focus on when building a strategy for their organization's adoption of cloud computing. This method also addresses the common problem that is being faced by different healthcare industry while implementing cloud computing. Challenges such as security concerns and interoperability will rise because of the cloud computing model. Therefore, the adoption of the cloud is progressing slowly. Through the implementation of best practices in the design, deployment, and use of it will hopefully generate a future growth of the cloud based systems adoption, despite all of the problems.

III. CONCLUSION

This paper presented a survey about Cloud Based Healthcare Monitoring System for Hospital Management. The privacy of the electronic health data in mobile cloud computing environment is a serious issue that requires special considerations. A review of the technologies and approaches that are currently being used to deal with the important issue of healthcare monitoring system. There are several challenges applied in cloud computing environment to the healthcare monitoring system and mobile healthcare suggestion service for hospital management. Challenges such as security concerns and interoperability will rise due to the cloud-computing model. Therefore, the adoption of the cloud is progressing slowly and not secured. Through the implementation of best practices in the design, deployment, and use of it will hopefully generate a future growth of the cloud-based system's adoption, despite all of the obstacles.

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