

IMPLEMENTATION OF CLOUD COMPUTING IN HEALTHCARE

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ABSTRACT

Every day, a massive quantity of data is produced. The information is critical for making decision and providing the best possible treatment to patients. Cloud Computing is cost effective approach for collecting storing and exchanging real time data amongst healthcare institution.

Cloud infrastructure has high throughput and huge storage capacity which are two crucial characteristics for effective data processing of large patient. One of the main concerns about employing cloud-based healthcare services is security and privacy. To leverage the cloud infrastructure, healthcare organisations must have electronic medical records. To keep up with the rapid improvements in information Technology and the widespread use of cloud-based services and efforts should be made to transition healthcare data from paper to electronic format Then, to govern and control the use of healthcare data, regional legislation and regulations should be enacted.

Keywords: Healthcare organizations, Cloud computing, Security and privacy, electronic health record

I. INTRODUCTION

The use of information technology in the healthcare sector is significantly underutilised, particularly in areas of operational efficiency.

Most healthcare practitioners and institutions still use paper medical records, which limits collaboration and coordination between patients and physicians. Cloud computing must be a central component of any healthcare modernization efforts. According to the National Institute of Standards and Technology (NIST), cloud computing can serve as a model that allows a set of configurable computing resources to share convenient and on-demand network access that is not typically provided in traditional healthcare environments. There are millions of patients, data must be carefully stored for future use in general and public concern. To deal with the situation, the healthcare industry is attempting to integrate their systems with cloud computing for better implementation. Cloud computing is a promising technology that has the potential to transform the healthcare industry's core system. This technology is adaptable, energy-efficient, low-cost, and quick to deploy, and it has the potential to help the healthcare industry cope with the current situation. Data management in the healthcare industry necessitates a strategic approach in order to maintain data quality and security.

Cloud computing provides broad network access as well as resource pooling to support large data sets derived from electronic healthcare records (EHR). Both features make it easier for multiple consumers to access computing resources via various electronic devices such as mobile phones and tablets, resulting in more timely access to critical medical data. Further more a cloud computing system is measured service that can analyse and control resource usage in relation to the type of service provided, such as storage and processing. In order for the cloud to it should be possible to use computing to provide desirable services to client built on foundation that facilitates the expected function the infrastructure is made up of both hardware and software resources also referred to as physical and abstraction layer

The physical layer consists of the server, storage, and network components, while the abstraction layer is made up of the software used to provide the service. Consumers' roles in the cloud system do not require them to manage the infrastructure itself; however, they do have the ability to control applications and configuration settings. As a result, cloud infrastructure can be provided for organisations and their multiple consumers, as well as for specific communities or the general public. Every day, enormous amounts of data are collected and stored in healthcare organisations. These data are critical for making decisions and providing appropriate treatment. Healthcare organisations must have EHRs in order to exchange data using cloud computing systems, which store, retrieve, and share patient data with other healthcare providers. Because the amount of healthcare data is constantly increasing, it will eventually affect the storage capacity of healthcare data servers, causing data retrieval to be slow. Cloud computing is the answer to the big data problem. It offers limitless storage space and simplifies the process of sharing patient data between healthcare organisations.

In order to retain the massive volume of data and increase analytics, proper data management and cloud computing can be advantageous to many elements of this industry

The problems of vast data in the healthcare industry, as well as the implementation of cloud computing to manage the data, will be discussed in this research paper.

II. BACKGROUND OF CLOUD COMPUTING

Cloud technology isn't really a big thing, but it represents the evolution of physical data centre technology to cloud data centres. Cloud Computing defined by National Institute of Standards and Technology (NIST) as a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources. Various servers and storage which can be rapidly provisioned and released with minimal management effort or service provider interaction.

Cloud Computing primarily provides three service models:

software as a service (SaaS)

- software as a service, is a business strategy that allows you to quickly access cloud-based web applications.
- SaaS is the highest level of cloud computing in which all services are provided by cloud providers
- the Cloud provider is in charge of overseeing the computing stack, which can be activated via a web browser.
- These cloud-based applications require a paid subscription to use. Some are available for free but some have limited access.
- Some examples of software as service are G-suite, Dropbox

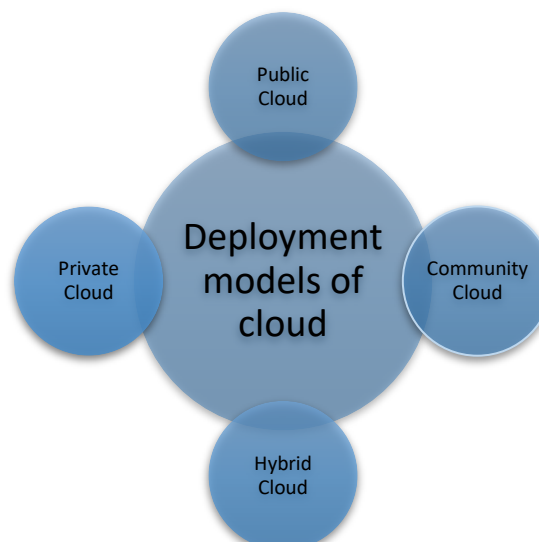
platform as a service (PaaS)

- platform as a service, is essentially a cloud model base that enables users to create, test, and arrange diverse business applications.
- By use of this model clarifies the process of creating enterprise software.
- PaaS offers an interactive runtime environment in which you can create and test different applications.
- All resources are presented in the form of cloud data storage, servers and network infrastructure that can be easily managed by the company or platform provider.
- Examples of Platform as service are AWS Elastic Beanstalk, Google App Engine.

Infrastructure as a service (IaaS)

- Infrastructure as a service, is essentially a virtual configuration of computing resources that can be accessed via the cloud.
- An IaaS cloud provider can provide your company with a complete computing infrastructure, including a storage device and network interface
- This infrastructure is also maintained and supported by the vendor.
- Businesses can use computing resources to meet their needs without installing equipment on their premises
- Some Examples of Infrastructure as a service

Cloud Computing Deploy As:



Public Cloud

A public cloud, as the name implies, is a cloud in which services are provided by third-party providers over an open platform for general use. Yes. It is open to the public, and data is generated and stored on third-party servers. One of the most popular cloud services is the public cloud deployment model. It's a popular choice for app development, file sharing, and non-sensitive data storage. And it typically has massive place it is recommended for collaborative projects.

Private Clouds

A private cloud infrastructure, also known as an internal or business model, is one that is specific to a company. The organisation controls and manages the systems in this model. While a private cloud server can be hosted by a third party (a service provider), most businesses prefer to keep their hardware in their on-premises data centre, in which an in-house team oversees and manages everything. It is recommended for business with very tight requirement

Hybrid Cloud

A hybrid cloud deployment model combines two or more cloud servers into a single architecture. Organizations can move data and applications between clouds using a combination of two or more cloud deployment models, depending on their needs.

Community Cloud

The only difference between a community cloud and a private cloud deployment model is the number of users. Whereas private cloud implies that a single company owns the server, a community cloud is comprised of several organisations with similar backgrounds. On a community cloud, businesses share infrastructure and related resources. This model facilitates joint business organizations, ventures, research organizations, and tenders, among other things. Community Cloud is a method of retaining the benefits of economies of scale with the private cloud.

III. OBJECTIVES

- In this paper we are focusing on how we can implement cloud computing in healthcare services.
- With the help of cloud computing lots of things can be implement in traditional healthcare system
- The purpose of this study was to present a systematic literature review of cloud computing technologies in healthcare and to analyse previous research
- Providing motivation, limitations encountered by researchers, and recommendations made to analysts for improving this critical research field methods.

III. METHODOLOGY

In this paper we shall get overview of cloud computing and its advantages in healthcare and pros and cons of cloud computing in healthcare. Reviewing the different literature, it is important to create reliable review to the knowledge. To obtained the result I checked the current states of cloud computing in healthcare and read all others academic and non- academic researches. I have collected all the information from journal papers, conference papers, technical reports, books, articles and different IEEE journals. The keywords used "cloud computing", "cloud computing in healthcare" filtered criteria help to get better result. The information provided is thorough, reliable, and the result of considerable primary and secondary research.

IV. ANALYSIS

One of the major factors boosting the global healthcare cloud computing industry is the rise of cloud-assisted medical collaborations. Because IT resources are obtained and used based on demand and requirement, cloud computing gives enterprises with cost and infrastructure flexibility. Cloud computing has numerous advantages in healthcare ecosystems, such as cost savings, greater flexibility, and system scalability. Cloud computing also makes it easier for different healthcare researchers and other stakeholders to collaborate on research. Furthermore, the researchers used Azimuth, a cloud-based application supported by Microsoft Azure, for their research since cloud enabled greater data collaboration.

The introduction of edge computing will accelerate the growth of the global healthcare cloud computing markets. Edge computing is a technique for optimising cloud computing systems by running computing applications at the network's logical endpoint rather than in the cloud or data centres. IoT devices are increasingly being used in

cloud computing in the healthcare industry for health monitoring and other applications. Furthermore, edge computing can help accelerate data collection and analysis, increasing overall process speed. In edge computing, sensors, controllers, and other connected devices collect and analyse IoT data on their own or send it to a nearby computing device for analysis, such as a server or laptop. As a result, data can be retrieved quickly and used in edge computing systems. Edge computing makes use of proximity of numerous IoT devices and their relationships with one another. Edge computing, on the other hand, creates a record of patients' vitals and events, which healthcare experts can use to ascertain an improved treatment regime for patients.

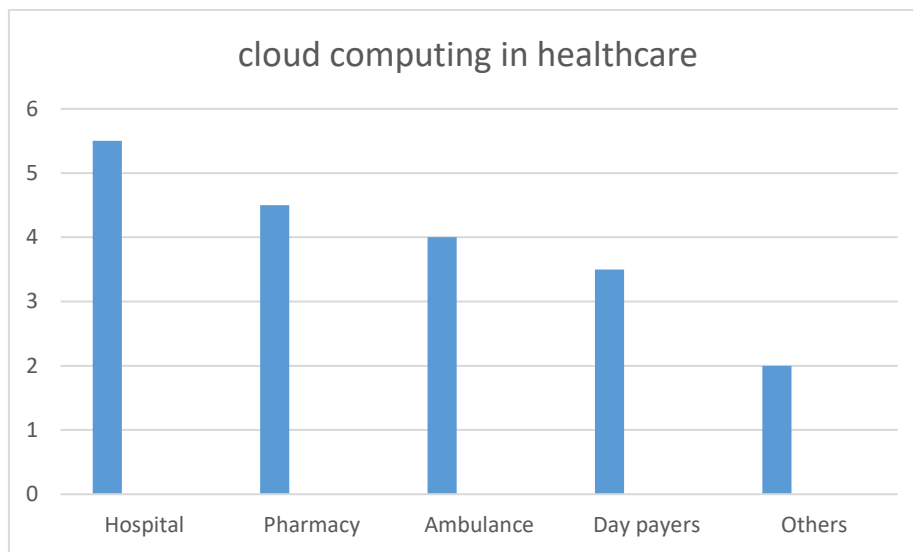


Fig: Uses of cloud in different industry

Some reasons for increasing demand of cloud computing in healthcare:

- Adaption of technology

Cloud computing is gaining traction among healthcare professionals for a number of reasons, including ease of interoperability, access to powerful analytics, patient data ownership, telemedicine capabilities, and cost savings. Cloud computing in healthcare has been shown to benefit both patients and medical professionals. The healthcare market has seen a massive shift from traditional storage to digitalization in the generation, storage, consumption, and sharing of healthcare data. Healthcare cloud computing's widespread adoption has compelled healthcare providers to use this technology to optimize workflows, gain efficiencies, and provide personalized care plans in order to improve outcomes.

- Demand for upgraded tools

The healthcare information systems segment will grow at a 13% annual rate until 2027, driven by rising demand for advanced tools in clinical function data management among healthcare organizations in healthcare facilities. Furthermore, the increasing emphasis on digitalization of the healthcare industry and the growing adoption of technology to store and integrate massive amounts of healthcare data will drive industry growth over the forecast period.

- Digital healthcare services

The software as a service (SaaS) is expected to exceed USD driven by rising digital health services provided by various vendors. Increased use of wearable devices, big data analytics, and the Internet of Things are some of the factors that will drive segment growth. Furthermore, factors such as faster deployment, lower cost of ownership, and security, among others, are accountable aspects for the overall industry progression.

By 2027, the hospital end-use segment will account for 22% of the healthcare cloud computing market. The rising number of hospital admissions, as well as the adoption of technologically improved products and sophisticated healthcare infrastructure, are all aspects that favour market demand. Furthermore, among all enterprises, hospitals are the early adopters. Large-scale operations, multi-functionality, data management, and cost-cutting are all factors that contribute to the widespread acceptance of healthcare IT solutions in hospitals throughout the world.

- Impact of covid on healthcare and recovery analysis

Covid-19 pandemic destroys the market lots of industries suffered because of less technical assets where on other hand lots of industries shifted on clouds and different technology. Because of new work from home culture adaptation of cloud computing increased.

The market growth accelerated to 23%. The information technology helped in growth of GDP market CAP. During the projection period, the healthcare cloud computing market share rise in the SaaS sector will be high. Because of their ease of deployment, shorter lead times than on-premises software solutions, and the service provider's ownership of maintenance and support chores, SaaS solutions dominated. For client relationship management (CRM), accounting, payroll, supply chain management (SCM), and healthcare information systems, healthcare firms use SaaS-based solutions.

Advantages of Cloud Computing in Healthcare:



Scalability & Flexibility In Work:

The cloud enables healthcare technologies such as electronic medical records, mobile apps, IoT devices, and so on. It provides worry-free scalability and flexibility, which improves final decision-making. Healthcare providers can use Cloud computing to increase or decrease their data storage based on patient flow. A cloud migration strategy also lowers risks and downtime, prevents data leakage, improves data processing, and strengthens security practices.

Cost-Effective:

Clouds can store a massive amount of data at a very low cost. Cloud computing allows users to select their subscription model. Healthcare providers can save money by purchasing the model that meets their needs with the help of this subscription model. The healthcare industry can use cloud servers to access resources provided by cloud providers.

Security and Reliability:

Patient's information is very critical so while storing to cloud keeping data safe is main concern of every system. Because it has unique security features that can alert you to suspicious attempts, cloud security in healthcare

networks provides security. Furthermore, even if a data breach occurs, healthcare providers do not lose any data and can minimize downtime for their staff by utilizing cloud computing.

Artificial Intelligence & Machine Learning:

During the crisis, AI and machine learning opportunities can be a critical solution that can support clinical decisions and provide faster treatment times. This combination will benefit the healthcare industry in general, not just during COVID. AI and machine learning are being integrated into healthcare cloud platforms' services. Simultaneously, cloud computing can help users manage massive amounts of data while supporting the transition of artificial intelligence to traditional healthcare.

Data Storage And management:

Healthcare providers manage a wide range of data, resulting in a large amount of data that not all internal devices can store. The healthcare industry can save money by not having to maintain physical servers and can store massive amounts of data thanks to cloud computing.

V. RESULTS AND DISCUSSION

The results and discussion may be combined into a common section or obtainable separately. They may also be broken into subsets with short, revealing captions. An easy way to comply with the conference paper formatting requirements is to use this document as a template and simply type your text into it. This section should be typed in character size 10pt Times New Roman.

VI. CONCLUSION

In the modern era, technological advancement has always been a benefit to various industries. The healthcare industry is currently facing enormous challenges as a result of the pandemic, and the demand for advanced technology is growing in this sector. The research analysis presented above leads to the conclusion that cloud computing can be used to improve data management procedures in the healthcare industry. Cloud computing can aid in the storage and management of data while also making it easily accessible to the organization. The adoption of cloud computing technology can enable the healthcare industry to store data efficiently and affordably while avoiding the use of physical servers.

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