

Cloud Computing In Healthcare Sector

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Abstract:

Cloud computing is a modern and rapid budding sector of evolution in healthcare. Information Technology (IT) has improved the healthcare sector through the latest evolution. Cloud computing in healthcare is growing and elegant as a critical approach by many of the contributors. It has the certain capability to provide boundless potential and ability of action in the e-healthcare section. This brings computers to be utilized effectively and entirely by the allocation of resources in healthcare.

Keywords: Characteristics, Service models, Advantages, and Issues.

Introduction

Cloud computing is one of the greatest radical technologies in the world. Cloud computing applications are growing rapidly in everyday life. The applications of cloud computing are so popular today that they are also used in the healthcare industry. Healthcare is defined as the services provided by a health care provider to individuals or groups for the treatment, promotion, management, or restoration of health. Cloud computing growth in health care is happening at a faster pace these days, We may expect a large portion of healthcare services to migrate to the cloud, putting a greater emphasis on delivering cost-effective and reliable healthcare facilities to people all over the globe.

Despite the firm belief that certain perimeters and cloud security issues prevent change; the healthcare industry is in control of the move to this cloud-based platform. Today, many doctors and hospitals are moving to this cloud to provide better medical services to their patients.

Cloud Computing

Cloud computing refers to software and services that are distributed through a network and are accessed and configured using modern internet network protocols and standards. Cloud computing has five key features, Three service models, and four deployment models.

Key features:-

- On-demand self Service,
- Broad network access,
- Resource pooling,
- Elasticity,
- Measured service

Service models:-

- Infrastructure as a Service (IaaS),
- Platform as a Service (PaaS),
- Software as a Service (SaaS)

Deployment Models:-

- Private cloud,
- Public cloud,
- Community cloud,
- Hybrid cloud

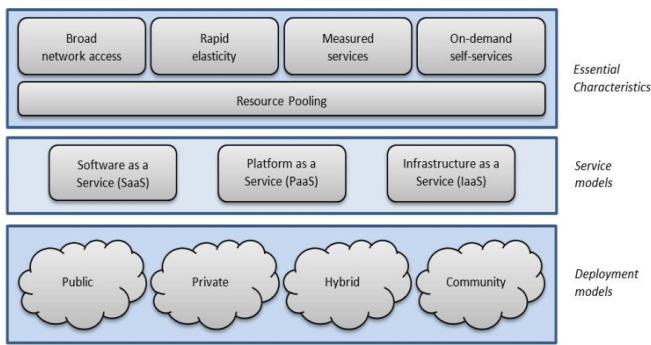


Fig 1: Definition of cloud computing

Cloud Computing In Healthcare Region

In today's world, cloud computing technology is growing rapidly in the healthcare industry. Traditionally, the health sector has not fully utilized technology, especially to improve patient care. The demand for cloud technology in the healthcare region is increasing day by day. Healthcare professionals are different from other industries and the main differences between the healthcare industry and other industries can be divided into three categories. First, this area is duly controlled by applicable legislation, along with regulations to protect patients. Second, as compared to other sectors, the cost of significant errors is higher in the health sector, and ultimately, the sector is composed of many groups such as hospital care workers, laboratories, and patients.

Good medical confidentiality and patient data privacy promote confidentiality, and misleading regulations can lead to serious consequences and even death. Using cloud computing in healthcare can improve the overall health system, especially in the areas of efficiency, effectiveness, and safety. Cloud computing provides the infrastructure that allows hospitals, healthcare organizations, and insurance companies to connect to research sites

that use computing resources at an affordable cost. Therefore, with the help of cloud computing in healthcare, doctors can access patient data even at great distances. Hence the use of cloud technology in healthcare can be beneficial for patients around the world.

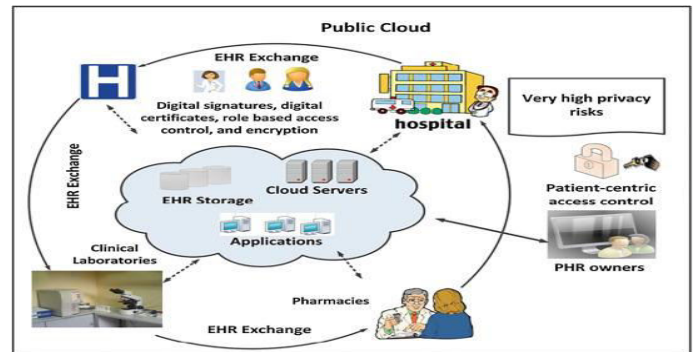


Fig 2: Cloud computing in healthcare industry

Cloud Computing Based Healthcare Services

Healthcare industries have used new technologies to streamline the process, offer new patient care applications, and ultimately improve health services. Despite employing IT solutions, healthcare organizations have increased infrastructure management costs, strong demand for computer equipment, human resource capacity, ubiquitous access, and increased rental housing. We face challenges such as the need for cooperation. This key challenge allows healthcare organizations to use cloud computing. Below Figure shows a cloud health service model. This model can be used as a reference to provide a variety of services to the healthcare industry.

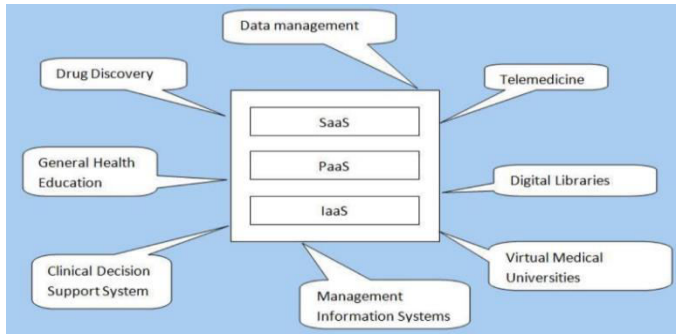


Fig 3: Cloud Driven Healthcare Service Model

Below is a description of cloud services for the healthcare industry that can improve traditional healthcare systems and reduce IT costs above the purchase price.

Data Management System

Data management is a major issue in the health care industry. Traditional methods of storing internal data involve significant investments in IT staff and storage infrastructure. Cloud data management and management systems like HDFS, Hive, HBase provide economical solutions to problems with increased security and manageability.

Telemedicine services

Telemedicine technologies such as remote surgery, telehealth, and Tele-radiology provide a new framework for collaboration and communication between health sector stakeholders. Telemedicine services not only allow patients to receive hospital care without leaving their premises but also help health care professionals share ideas for solving complex medical problems.

Drug Development

Discovering drugs is a way of discovering new drugs and confirming their effectiveness and any side effects. This process requires many computers to identify potential therapeutic compounds from trillions of chemical systems. This new technology

reduces the importance and time of finding drugs.

Digital Library Services

The library is the basis for the promotion of knowledge among medical students, researchers, and professionals. However, paper medical libraries, especially in developing countries, cannot meet the needs of people due to financial constraints. Modern cloud libraries are seen as an opportunity. Cloud providers can provide a variety of services to libraries, including file storage, viewing services, query languages, hospitality services, and library management systems.

Virtual Medical Systems

Cloud computing has also taken root in schools due to its simple and cost-effective structure. IT companies such as Amazon, Google, Microsoft, IBM, and HP continue to develop applications for libraries and external libraries. Medical colleges can use this product to give online lectures, hold seminars, and facilitate collaboration among professionals around the world. This helps health facilities, especially in developing countries, find more learners at affordable prices and with less effort.

Management Information System

Health care professionals are starting to use management systems to improve the flow of information within and outside of organizations. Doctors use this system to provide better patient care. Customers use them to request services. Administrators use it to manage personnel, salaries, and funding. Senior management uses this system for visionary decision-making and purposes. This is a financial system that contains important information

about your organization.

Advantages of Cloud Computing In Healthcare Sector

Cloud computing introduces a new business model that offers multiple advantages that would benefit the entire healthcare team.

- 1) **Data storage capacity:** The key to big cloud applications in healthcare today is data storage. The healthcare industry processes a lot of data and even modern consumer electronics can't control everything. Cloud networks allow healthcare professionals to store all of their data online, avoiding the cost and hassle of maintaining physical servers.
- 2) **Scalability of service:** Medical needs are available 24 hours a day, but some hours, such as winter and flu, require extra care from the healthcare providers. Clouds can scale to increase or decrease the amount of data and traffic according to customer requirements. Therefore, healthcare providers can fit their network needs to their service requirements.
- 3) **Security:** Healthcare data must be kept confidential. Attackers, security breaches, and data breaches are all attracted to the growth of knowledge in this field. Cloud networks are secure because they are equipped with special security software that can detect and report potential threats.
- 4) **Collaboration:** Clients using this cloud network can easily transfer data to each other. This is a huge advantage in situations where healthcare companies need to share medical information

with each other.

- 5) **Decreased costs:** Doctors and physicians do not have to invest in equipment upgrades and maintenance because these factors are addressed by cloud billing providers.
- 6) **AI and machine learning:** Cloud platforms integrate AI and machine learning into their operations, helping to lighten some loads. Healthcare providers can use these systems to analyze and respond to a large amount of unstructured data they use.

Examples of cloud computing technologies used in healthcare management and the use of cloud services in the emergency healthcare process

In emergency care services, both pre-hospital and in-hospital facilities are used. From administrative to medical treatment, there are a variety of interrelated practices. As a result, proper effective communication and coordination between healthcare institutions and Emergency Medical Services (EMS) are needed. Additionally, emergency responders' interaction is essential. So the Emergency Data Exchange Language (EDXL) was created by the Association for the Advancement of Structured Information Standards Emergency Management Technical Committee to help EMS share useful information among regional and national organizations. Integrating cloud computing systems with emergency care services systems allows for faster data recovery from the patient's personal healthcare record (PHR) or electronic health record (EHR). This data will assist paramedics in making

the best decision and managing patient's conditions based on their medical records.

1) Cloud computing and body sensors

Wireless Sensor Networks involves Body Sensor Networks. It is made up of sensor nodes that are used to keep track of physical, environmental, and human conditions. BSN is used in the medical field to track changes in a patient's condition, such as temperature, heart rate, and blood pressure, through the remote transmission of signals. These sensors generate vast volumes of real-time data that can be sent and processed in cloud storage before being transferred to healthcare organizations for analysis and interpretation by medical personnel. The Body Cloud System combines BSN and cloud computing to enable data collection and transfer to healthcare organizations. The auto-injection of insulin through a pump in response to a decrease in insulin levels is an example of BSN. Another method is to look for changes in heart waves and vital signs to recognize a heart attack occurrence. Non-invasive and cost-effective BSN applications are available. They have real-time data in order to increase the long-term efficiency of healthcare services by detecting and preventing diseases early. Advanced mobile apps combined with cloud computing technologies make such systems easier to use for healthcare professionals. These systems are especially useful for patients with chronic illnesses that need constant supervision and who are unable to obtain consultation from healthcare clinics or hospitals, such as patients in rural areas. Cloud computing has a high throughput and huge storage capacity, which are two critical factors for efficient data collection

of large patient populations. Below figure illustrates how mobile devices and WBANs are linked through the internet, with real-time data being sent to cloud servers.

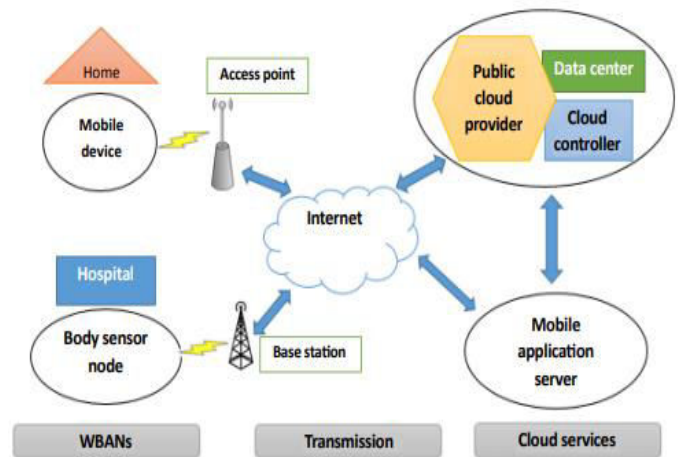


Fig1: WBANs with mobile cloud computing

2) Cloud computing and digital imaging communication in medicine

A picture archiving and communication system (PACS) is a method for managing medical images in clinical settings. It's used to store, retrieve, and distribute medical images that are crucial to medical decisions and complicated care procedures. The Digital Imaging Communication in Medicine (DICOM) standard is a storage and delivery standard for medical images. Within organizational Virtual Private Network (VPN) connections, however, DICOM use is limited. Web 2.0 is only partly compatible with DICOM and allows only image retrieval via the Internet. Medical facilities depend on manual systems, such as VPN, which requires point-to-point configurations and is not scalable. Other options include CD/DVD or text. However, when accessing medical imaging remotely during an emergency situation, these techniques are ineffective. Such issues can be solved by using technologies that

incorporate a cloud computing service with DICOM. It allows mobile devices to view medical images online directly from the EHR or PHR.

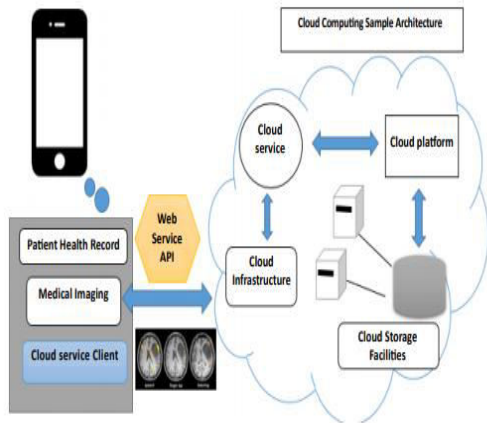


Fig2: The use of cloud computing in the display of medical images.

Patients access to their own health records stored in the cloud from their smart phones, as shown in Figure.

Challenges and Issues of Cloud Computing In Healthcare Industry

Healthcare providers and patients have easy access to electronic health record applications and services in the cloud. This support can lead to key security challenges related to user efficiency, accessibility, policy integration, and trust management. Key challenges include distrust of data security and user privacy, organizational incompetence, loss of leadership, and failure to pay suppliers. Other technological challenges associated with using cloud computing include resource scarcity, unpredictable performance, data blocking, data transfer problems, and major cloud system failures.

The delay in taking the cloud computing model into healthcare was due to two important issues related to security and interaction.

Security Issues:- Always, data stored in the cloud can contain personal, private, or confidential information about a person's health history and medical records, which must be kept confidential to prevent misuse. Global concerns about data jurisdiction, data protection, security, and enforcement are having a significant effect on healthcare organization's adoption of cloud technology.

Interoperability:- Integration is one of the biggest challenges in pushing healthcare systems to the cloud. Software developers need to share a design product with a data set that they can interact with and integrate with. Integration of critical data and requirements required for system integration. Therefore, interoperability and integration can be achieved using global standards that facilitate maintenance, updating, and management.

Conclusion

Our lives are transforming in various ways by cloud computing. The use of cloud computing technology is increasing daily in all parts of the world. As said before, there are many reasons to use cloud technologies in the healthcare sector. The current use of cloud computing in the healthcare field can not only improve and solve some of the collaboration information problems in healthcare organizations but also increase funding. Cloud computing is not just focused on solving storage, bandwidth, and other issues; it has areas that help healthcare data systems save money by improving resources.

References

- [1] Kai Hwang Geoffrey C. Fox Jack J. Dongarra
“Distributed and Cloud Computing” ISBN: 978-0-12-385880-1 pg 192-203.
- [2] Barrie Sosinsky “Cloud Computing Bible” ISBN: 978-0-470-90356-8 pg 7-19, 66-73.
- [3] K.Chandrasekaran “Essentials of Cloud Computing” 2015 pg 45-95.
- [4] Thomas Erl, Zaigham mahmood, and Ricardo Puttini “Cloud Computing Concepts, Technology & Architecture” ISBN:10-0-13-338752-6 pg 58-78.
- [5] Aziz HA and Guled A “Cloud Computing and Healthcare Services” Journal of Biosensors & Bioelectronics, ISSN: 2155-6210 Volume: 7 Issue: 3.
- [6] Roma Chauhan and Amit Kumar “Cloud Computing for Improved Healthcare” The 4th IEEE International Conference – EHB.