A Study of Public Private and Hybrid Cloud in Healthcare

Dinesh Soni[1], Dr Lakshmi JVN[2]

[1]Master student, Department of MCA, Jain Deemed-to-be University, Bengaluru, Karnataka, India
[2]Associate Professor, Department of MCA, Jain Deemed-to-be University, Bengaluru, Karnataka, India

ABSTRACT

Adoption of cloud computing in healthcare sector is widely expanding. Cloud has solutions for everyone from everywhere. It provides seamless connectivity and amazing storage services to the people and organizations. Cloud refers to a remote network from where we can access, manipulate and configure both hardware and software resources. The paper is a comparative study among the cloud deployment models like public cloud, private cloud and hybrid cloud that is used by healthcare sector. Cloud computing offers personalized care for the patients while it improves the efficiency of healthcare sector in storing and manipulating healthcare documents and decreases the operational cost. The major concern of the healthcare industry in adopting cloud deployment is the data privacy as the cloud storage is not transparent enough. The main objective of this work is to compare public, private and hybrid cloud deployment models in healthcare in terms of data security.

Keyword: - Public Cloud, Private Cloud, Hybrid Cloud, Data Privacy

1. INTRODUCTION

Enormous amount of data is created everyday through internet. This data volume is highly affected by the invention of smart devices and IoT. Based on the current estimate, the data is produced at a rate of 1.145 trillion MB per day. All these data should be stored, organized and backed up somewhere. Here comes the significance of cloud storage. Cloud storage is relying on a virtualized storage infrastructure with accessible interfaces. It provides elasticity, scalability and multi-tenancy. In cloud, data is stored in commodity storage servers located on premises or in a data centres managed by third party cloud service providers. Based on the necessity of users, the service is provided on demand. The cloud deployment models private, public, community and hybrid are defined by the type of access to that particular model. Cloud computing is successfully adopted and implemented by several industries like automotive, educational, financial, healthcare, insurance, hospitality, production, real estate, legal and non- profit organizations.

The healthcare industry is going through a transition after adopting cloud. In cloud healthcare solutions, the health records are stored and processed in cloud. The most important concern is the security and privacy of patient details. In a cloud based patient record system, privacy is ensured using Health Insurance Portability and Accountability Act (HIPAA) protocol. HIPAA protocol mentions the rules and policies required to store and share medical data. In this paper, three cloud deployment models namely public, private and hybrid models are explained and compared. In section 2, cloud solution in healthcare industry is represented. In section 3, 4, and 5, public, private and hybrid cloud in healthcare is being explained respectively. In section 6, these models are compared and the results are discussed. In section 7, the paper is concluded with the results discussed in the work.
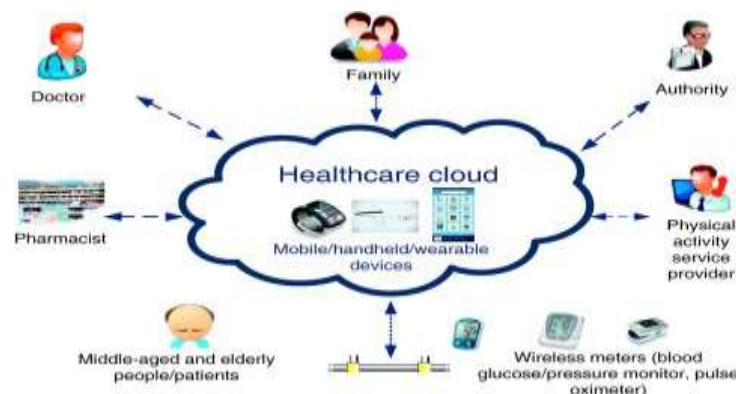
2. HEALTHCARE CLOUD

Fig 1: Cloud Infrastructure in Healthcare

The above image (Fig 1) is showing the cloud infrastructure in healthcare sector. It includes healthcare professionals like doctors, hospital authority, physical activity service provider, pharmacist etc. and clients like patients and their family. All these cloud users are accessing the cloud for data storing, sharing and manipulation using smart devices and wearable devices. The picture is also demonstrating that the patient health details are collected using wireless devices. This kind of deployment provides real time care for patients.

3. PUBLIC CLOUD IN HEALTHCARE

Public cloud is a cloud service where resources are made available publically via the internet. This provides storage capabilities, applications and virtual machines. Public cloud is used in healthcare sector to store, maintain, manipulate and access electronic health records.
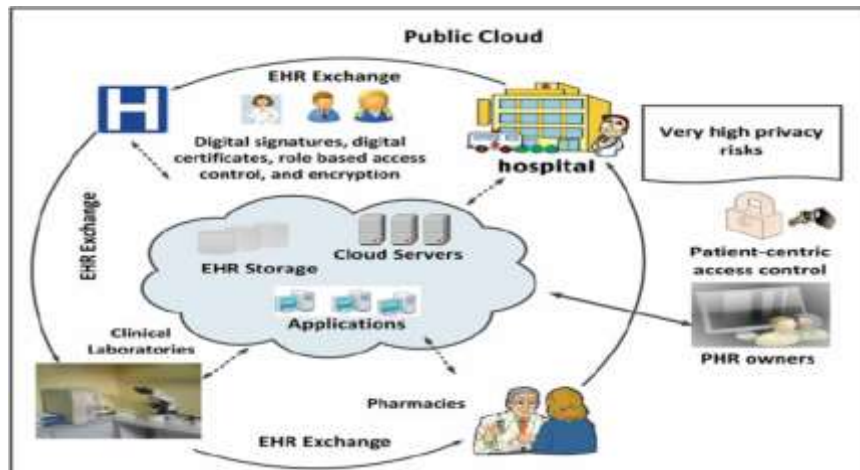

Fig 2: Public Cloud in Healthcare [9]

Just like public cloud, public healthcare services are also shared among multiple entities. These users include multiple hospitals, clinics, medical insurance companies, medical equipment companies, medicine suppliers, laboratories etc. Here, the health records are stored in remote servers maintained by cloud service providers. Public health cloud is having vulnerabilities and privacy issues due to internal and external threats. This can be reduced by using encryption and access control mechanisms.

4. PRIVATE CLOUD IN HEALTHCARE

Private healthcare cloud is owned by a healthcare organization or a hospital. As this is private, it is secured than public cloud. Here, the access control policies are given more importance. This kind of healthcare cloud deployment model is managed by the healthcare professionals with official credentials. The threat that may happen to private cloud can be from insiders. It is also easy for an organization to implement additional security measures and protocols because they are having full administration control over the model.
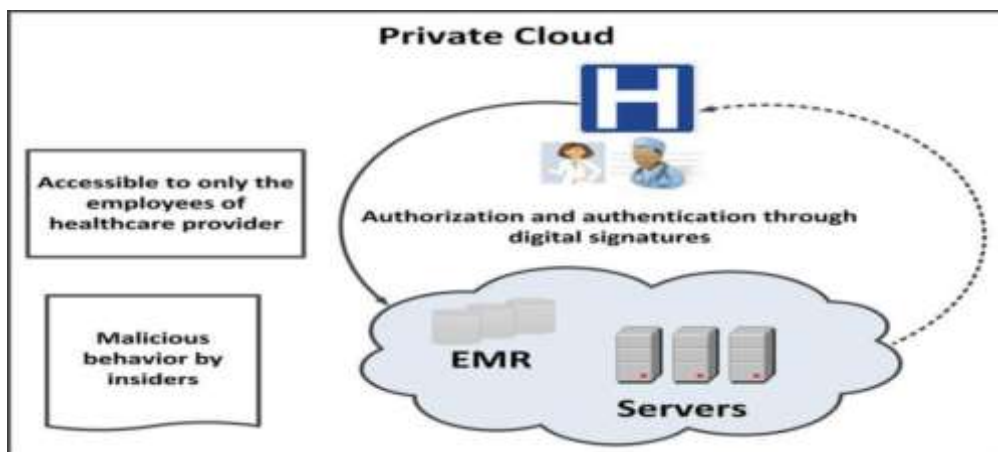

Fig 3: Private Cloud in Healthcare [9]

5. HYBRID CLOUD HEALTHCARE

Hybrid cloud is a combination of public and private cloud deployments. While using hybrid cloud in patient health record system, it brings the benefits of both public and private cloud models. Hybrid cloud ensures legal protection for confidential information. Out of date hardware and operating systems can also be continued in a secured manner using hybrid cloud deployment model. As patient's personal information is a sensitive matter, hybrid cloud can be a best fit. For instance, the website can be deployed on a public cloud for leveraging scalability advantages and deploy the database in private cloud to secure the data.
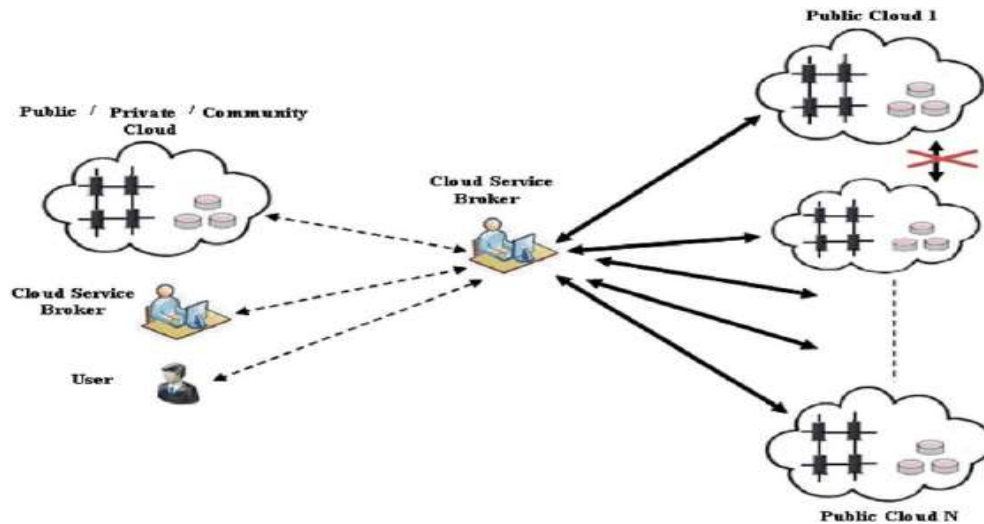

Fig 4: Hybrid Cloud Healthcare

6. COMPARISON STUDY

Table 1: Comparison among public, private and hybrid cloud

	PUBLIC	PRIVATE	HYBRID
OWNERSHIP	Third Party	Dedicated	Combines public and private
SECURITY	Low	High	High
FLEXIBILITY & SCALABILITY	High	Moderate	High
TECHNICAL SKILL REQUIREMENT	Low	High	Moderate
EXPENSE	Pay per Use	High	Cost Effective

The paper has discussed three cloud deployment models that can be adopted for electronic health record management systems. From the study, hybrid cloud model is the best fit as it provides high security, compliance, flexibility, scalability and legal protection. This is the most cost effective approach in securing healthcare information.

7. CONCLUSION

The paper has systematically analysed several factors of three cloud deployment models namely public, private and hybrid for choosing a suitable deployment for patient health records management. The study identified hybrid cloud as a perfect model for storing, processing and sharing sensitive information in the healthcare sector. This can be easily and effectively used by both the patients and the healthcare organizations. This kind of cloud deployment model is adopted by more and more organizations as it ensures legal compliance in addition to security and user privacy. Public, private, community and hybrid cloud deployment models are having their own importance and benefits for healthcare sector. Security should be given greater importance along with budget and convenience. Building and deploying a hybrid cloud solution for hospitals and other healthcare institutions can help meet many of the security and privacy challenges when designed and implemented thoughtfully to match the needs of the organization.

8. REFERENCES

[1] Gade, Nikhita Reddy & Reddy, Ugander. (2014). Study of Cloud Computing in HealthCare Industry.

[2] Raghavendra Ganiga, Radhika M Pai, Manohara Pai M M, Rajesh Kumar Sinhaa, Private cloud solution for Securing and Managing Patient Data in Rural Healthcare System, 3rd International Conference on Computer Science and Computational Intelligence 2018.

[3] R. Chioreanu, M. Crişan-Vida, L. Stoicu-Tivadar and V. Stoicu-Tivadar, "Implementing and securing a hybrid cloud for a healthcare information system," 2014 11th International Symposium on Electronics and Telecommunications (ISETC), 2014, pp. 1-4, doi: 10.1109/ISETC.2014.7010776.

[4] https://hitinfrastructure.com/news/comparing-public-private-hybrid-healthcare-cloud-storage

[5] https://www.businesswire.com/news/home/20201208005193/en/Study-Shows-Future-of-Healthcare-is-Shaped - by-Hybrid-Cloud

[6] https://www.riverpublishers.com/journal_read_html_article.php?j=NBJICT/2018/1/9

[7] https://www.cxotoday.com/press-release/study-shows-future-of-healthcare-is-shaped-by-hybrid-cloud/

[8] R.Balasubramanian, M.Aramudhan, Security Issues: Public vs Private vs Hybrid Cloud Computing, International Journal of Computer Applications (0975 – 8887) Volume 55– No.13, October 2012.

[9] Abbas, Assad. (2016). e-Health Cloud: Privacy Concerns and Mitigation Strategies. 10.1007/978-3-319-23633-9_15.