

Mobile Healthcare Cloud As a Service

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-----ABSTRACT-----

Today mobile healthcare service has expanded its area on a large scale. People find it comfortable and easier to access source rather than going to the hospital every time. The paper reviews the various aspects of the mobile healthcare system. It explains the access model by including every minute detailing and the flow process of the e-healthcare cloud. The work evaluates the mobile healthcare system with the security aspects required for different medical related areas. It compares various required medical related functions that could be performed using different mobile devices on a percentage based criteria.

Keywords – Cloud Computing, Mobile computing, Mobile healthcare, Data mining, Data security, Data privacy.

1. INTRODUCTION

The emerging trends in IT sector particularly cloud, big data, mobile etc. urges ubiquitous accessibility, high bandwidth and dynamicity for network management. Increasing demand for big data and the diversity of Multimedia contents demands higher connection speed to setup communication in the network. The electronics and communication era secures a wider penetration of the mobile devices and the social network services. Surveys have predicted that by the year 2018, the number of people connected through mobiles will exceed to 1.4 mobile devices per capita. In 2012, according to survey by Facebook, the users have expanded from 1 million (in 2004) to 1 billion active users, which is kept on expanding the interest as well to stay connected [1] [2].

The ways of healthcare study services are changing day by day. A new field can be emerged in the form of e-medicine that would help providing services to the various users (might be the healthcare students, patients, doctors or others who seek for healthcare services). It definitely would be an easy to access service as the user is just an internet connection away. The ubiquitous and distributed environment of cloud computing can benefit the healthcare users with a combination of mobile and cloud computing [3]. Through mobile terminals user can directly access the freely available resources and computing capabilities. In the new-environment of mobile cloud based e-medicine till now there have been comparatively frequent studies which aimed at facilitating all kinds of users. Due to the maintenance of the data facilities like security, privacy, optimization, etc. makes it difficult to be implanted on a large scale. This kind of facilities are easy to set up if the application areas are e-learning, advertising or similar areas, as they require user authorization for some specified data and services. But, if it is about e-medicine most of the contents are specified under privacy perseverance which needs a secure network communication [4] [5].

This paper is organized as follows. In Section II, mobile cloud formation & components are explained. Section III presents related work as a comparative study is explained, Section IV presents the mobile-healthcare cloud threats are described. Section V gives the brief explanation of evaluation process then section VI concludes the paper and gives future directions.

2. MOBILE CLOUD COMPONENTS & FORMATION

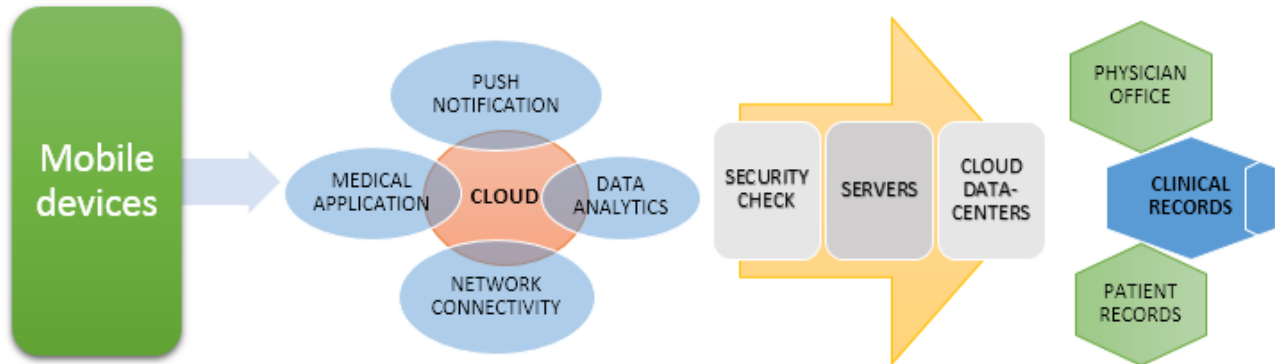


Fig-1: mobile healthcare process model

Mobile healthcare now has become a comprehensive health monitoring service which is based upon an intelligent emergency management system. Today there are a number of applications through which one can reduce the process of going to hospitals. Though for the patients it deals with the small recommendations, but for doctors and the hospitals, mobile-healthcare plays a big role. The healthcare cloud can manage multiple hospitals and various segments. Today, there is a possibility the doctors sitting thousands of kilometers far can treat the patient through the internet. Health-aware mobile devices can detect pulse-rate as it also provides pervasive access to healthcare information [1].

The working of the mobile healthcare devices is simple yet powerful. The cloud that associates with distributed servers working as information storage and communicating servers (refer fig-1). When mobile devices are connected through the internet it accesses the specified cloud through a login account, ensuring to be a security check according to the user access type. It gets access through the medical cloud application communicating through network [6]. The user or patient passes the notification according to the requirement and cloud retrieves information from the particular server. To access the data it one has to pass through a strong security check as the medical field has some legal acts to access the information whether it is an employee of the hospital or the doctor, only authorized users can access the particular detail. Query passes to the cloud datacenters where it may be served by the required area. The major categories that are usually accessed through the mobile care is the physician office, clinical record storage databases and the databases which store patient records [5].

3. COMPARATIVE SITEMAP

In a review of around 13 evaluation studies of physician practices and mobile devices in the in the area of computerized tomography scans or reading electrocardiographs found the three major benefits. Firstly, physicians accessing through mobile devices responded more frequently to read medical test results. Second, errors were calculated in medication prescription and hospital discharging through the mobile-healthcare system. Thirdly, doctors validated with an improved data management & the record keeping practices. It helps in avoiding errors which are the primary strength of the mobile healthcare system.

Pilot projects in India and Sri Lanka recently found mobile devices much helpful to monitor the dengue fever outbreaks. Before the mobile communication, usually it took provinces 15 to 30 days for reporting data to the central authorities. This was time consuming which used to slow down the treatment responses and could provoke infectious diseases to spread. In [7] researchers proposed a secure strategy which could employ trust to evaluate behavior at each server node. This system allowed only trustworthy nodes for actively participating while network communications and the malicious nodes were effectively prevented to the breakthrough which helped in reducing additional overheads also. A. Toninelli [6] proposed semantic based discovery validated to be a secure framework for the mobile healthcare enterprise networks. This could

exploit semantic metadata including the profiles and policies allowing flexible and secure service retrieval. The approach integrated access control functionalities contained by discovery framework to provide users with the filtered views based on user security credentials & service access requirements.

Monitoring patient can experience flexibility & powerful patient surveillance through the wearable devices at any instant of time. This positive feature of the mobile healthcare attracts many challenges for healthcare providers, hospitals, policy makers and also for the patients. To preserve privacy a privacy technique was presented by Ren [8] which could be used for monitoring patients effectively. It could enhance functionality of the telemedicine systems and also protected the data with a secure algorithm. In [1] a healthcare alert management system was demonstrated in handling the alert messages systematically. To specify alerts associated with medical tasks and a set of parameter for routing model was designed efficiently. This mechanism could maintain and reroute the alert messages on demand.

4. Mobile-HEALTHCARE CLOUD THREATS

Different proposals have witness mobile threats with various encouraged root cause origins. Different threats seeks different malware detection utilities and methods. Some similar studies can be listed as the following.

- a. Usually android platform allows users for installing applications from 3rd-party environment which makes no efforts to validate the safety of the software.
- b. It is quite easy to port existing Windows based botnet client on the mobile platform.
- c. Different market serves different defense utility & revocation policy for the malware detection [10].
- d. Mobile apps developers can upload their applications freely without any check of trustworthiness. As they are declared as self-signed and doesn't require any certification authority.
- e. Some malwares detect presence of emulated environment & adapt their behavior, for e.g. restart on reboot, creating hidden background processed and scrub logs [5].

These are the mobile threats that are being observed when users use cloud applications. The healthcare data demands for a better authorization communication between user end & the server end. Some malicious behaviors can be seen during the process network accessing are:

- a. Private data leakage or sensitive data exfiltration.
- b. Escalation privilege to root.
- c. Dialing premium inputs to login.
- d. Botnet activity
- e. Backdoor triggering through concerned area spoofed SMS.

These studies help researchers figure out the problem domain to help developers resolving such issues not just for the healthcare mobile cloud, but for all the fields that serves the concerned essence [2] [5].

5. EVALUATION

Analysts say that the mobile health clearly has expanded on a large scale. By 2017, it is expected to choose a standard of multi-billion dollar field. According to a PwC report mobile healthcare project annual revenues have approached 23 billion dollars worldwide, where in Europe it includes \$6.9 billion, \$6.8 billion in Asia, \$6.5 billion in North Americas, \$1.6 billion in Latin America and in Africa it is a project of worth \$1.2 billion [4]. Mobile technology is especially helpful to prevent chronic health, disease as it frees physicians from daily visits of the doctors and still could manage observing patients' health. Table-1 predicts the statistics of different uses of the mobile devices. This clearly says the most effectively doctors and patients use it to look up materials for the drug and treatment references [8]. The least frequently it is used for accessing patient information and the records. As it requires a highly secure system and the accessibility to only few authorized users. The medical data (out of the major other fields like education, banking, etc.) has the comparatively very low information utility as it is strictly out of the law to freely avail the data for public. To study the security standard regarding this field table-2 gives a view over the security trends in the healthcare industry [9].

Table-1 percentage based mobile healthcare facilities characterization of different mobile devices

Characteristics	Usage (in %)		
	Tablet (A)	Smartphone (B)	Smartphone & tablet (A ∪ B)
Choosing treatment paths for patients	33	39	43
To diagnose patients	27	39	44
Educate the patients	26	25	33
Learning about new research and treatments	44	39	50
Accessing patient related data	24	15	31
Look up for drug and treatment reference materials	65	67	73
To make decisions about ordering labs	21	26	28

Table-2: security trends in the healthcare industry.

Security required fields	Security Percentage (in %)
Having immature security policies.	23
Conducting system-wide data backups that are regularly tested.	51
Having effective controls over removing access employee leaves.	25
Not to use standardized data classifications.	39
Not to have asset management policies and conducting asset discoveries manually.	28
Having a disaster recovery program.	31

6. CONCLUSION

The review over the mobile healthcare spills the beans over its advantages. Its high management skills have now even engaged the opinion leaders and eventually helped physicians by providing them a comfortable routine. It has incremented the tendency and has improvised the behavior of the users by reducing their stress regarding time and cost. In this new era, hospital committees too are taking decisions based on value and statistical outcomes from the mobile devices. The mobile healthcare system played a major role by improving data mining activities, gives highly recommended remote control. This helps in sharing information sitting far from the one location with a secure approach. Helps in managing the system for Tele-healthcare and helps in resource integration as it maintains an intelligent analysis protocol.

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