# A COMPLETE AND SECURE E-HEALTH DELIVERY SERVICE SYSTEM FOR INDIA USING AADHAAR BASED AUTHENTICATION

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**Abstract-** This paper proposes a complete novel system for E-Health in India. The system uses Aadhaar based authentication. So far the health service system in India is not centralized. Due to confidentiality reasons records of patients are stored in respective hospitals (or centers). If the patient moves to another hospital, he has to carry the entire record with him. Or if a random victim is found on a road accident, there is no method to get his medical records instantly. The proposed system stores all the Patients medical records in a centralized server. Current proposed system specifies one server per state, to distribute the load across various servers. The centralized server is granted access to all medical service centers throughout the country. Hence if the patient moves out of his locality, even to another state, his records will be available from the server of his origin state. Aadhaar based authentication is used in this system. If a patient needs service in a center, his finger print scanned by the center and send to the UIDAI database, that returns the corresponding Aadhaar number, photo and other personal details of the patient. Thus the center can confirm the identity of the patient just by the finger print and grant (or deny) access to medical facilities, which is more secure than relying on the patents statements. The system also provides rights to the centers to update the patient's records in the centralized database from new diseases or changes of medications. Major advantage of the proposed system is in emergencies such as road accident. Just scan the finger of the accident victim, his medical history and records will be available instantly for further medical help. Another major advantage of the proposed system is, the finger prints of most Indian residents are already stored in the UIDAI database, hence only the medical records database from different locations have to be integrated.

**Keywords-** E-Health, UIDAI - India, Aadhaar, Medical Records, Health Services

## I. INTRODUCTION

Health services include all services dealing with the diagnosis and treatment of disease, or the promotion, maintenance and restoration of health. They include personal and non-personal health services [1]. Health services are the most visible functions of any health system, both to users and the general public. Service provision refers to the way inputs such as money, staff, equipment and drugs are combined to allow the delivery of health interventions [1]. Improving access, coverage and quality of services depends on these key resources being available; and how services are organized and managed. Equity in health outcome is the ultimate aim [1].

Health system service delivery is people- centric and integrated health services are critical for reaching universal health coverage [2]. People-centric care is care that is focused and organized around the health needs and expectations of people and communities, rather than on diseases [2].

e-Health is the use of information and communication technologies (ICT) for health. The e-Health unit works with partners at the global, regional and country level to promote and strengthen the use of ICT in health development, from applications in the field to global governance [3]. E-Health helps to deliver heath system services to the public in a more reliable method.

The Unique Identification Authority of India (UIDAI) is a statutory authority established under the provisions of the Aadhaar Act, 2016 by the Government of India, under the Ministry of Electronics and Information Technology (MeitY) [4]. UIDAI was created with the objective to issue Unique Identification numbers (UID), named as "Aadhaar", to all residents of India that is robust enough to eliminate duplicate and fake identities, and can be verified and authenticated in an easy, cost-effective way [4]. Front and back of a sample Aadhaar card is shown in Figure 1 and 2 respectively. As seen in Figure 1, the front of the Aadhaar card has the holder's picture, name, date of birth, sex (gender) and the Aadhaar card number. The back of the Aadhar card has just the address and card number (Figure 2). The Aadhaar card holder's finger prints are stored in the UIDAI database that can be accessed by permitted authorities to fetch the finger prints any time.

This paper introduces a novel system to deliver health services using e-Health and Aadhaar based authentication. Section 2 explains the proposed Health Service Centre updated with computing resources. Section 3 provides details of the network between the Health Service Center computing resources and UIDAI and Medical records databases. Section 4 clearly explains the procedures in the complete proposed system. It starts with the steps to be followed by the staff in the Health Service Centre to implement the Service system. This section also explains the complete computerized automatic operations that should take place as an effect of the manual request of the Health Service Centre staff.

Section 5 discusses the implementation issues of the proposed system. Section 6 debates the advantages of the proposed system. Final section concludes the paper.




**Fig.1. Sample Aadhaar Card - Front**




**Fig.2. Sample Aadhaar Card - Back**

## II. PROPOSED HEALTH SERVICE CENTRE

Figure 3 illustrates a typical Health Service Center that delivers the health services. The Centre has a Reception (R), Doctor's rooms (D1, D2), Investigation rooms (I1, I2, I3), Pharmacy (P), Clinic room (C) and Ward (W). All of the mentioned rooms (R, D1, D2, I1, I2, I3, P, C, and W) are equipped with a Computer. The Server room has a high end server that is connected to all the computers in other rooms. The high end server is also connected to the external world to communicate with UIDAI server and State Medical record database server.

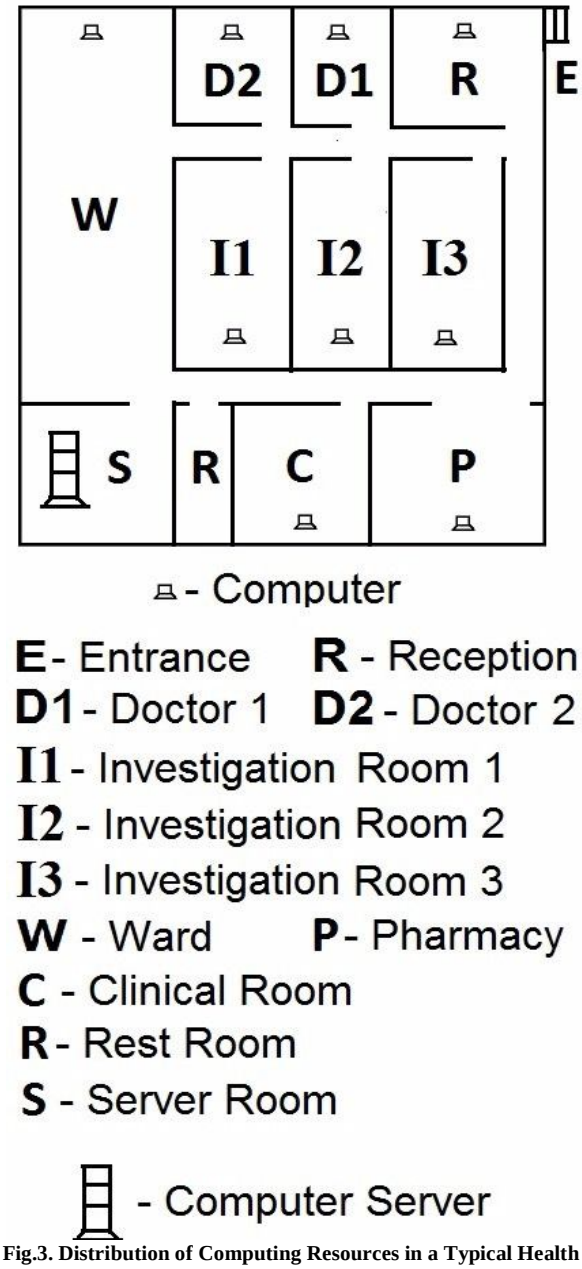



**Fig.3. Distribution of Computing Resources in a Typical Health Service Centre**

## III. NETWORK BETWEEN HEALTH SERVICE CENTER COMPUTING RESOURCES, UIDAI AND MEDICAL RECORDS DATABASES

Figure 4 shows the network between Health service center's computing resources, UIDAI database and medical records database. As already mentioned in section 2 all computers inside the health service center is connected to the high end server present in the same building of the health center (Refer Figure3). The health service center's High end server is connect4ed to the UIDAI Server. The UIDAI Server is connected to the Mapper (Functionality will be explained later). The Mapper is connected to the State Level database servers and the State Level database server is connected to the health service center's high end server.

The connections mentioned so far are shown in solid lines in Figure 4.

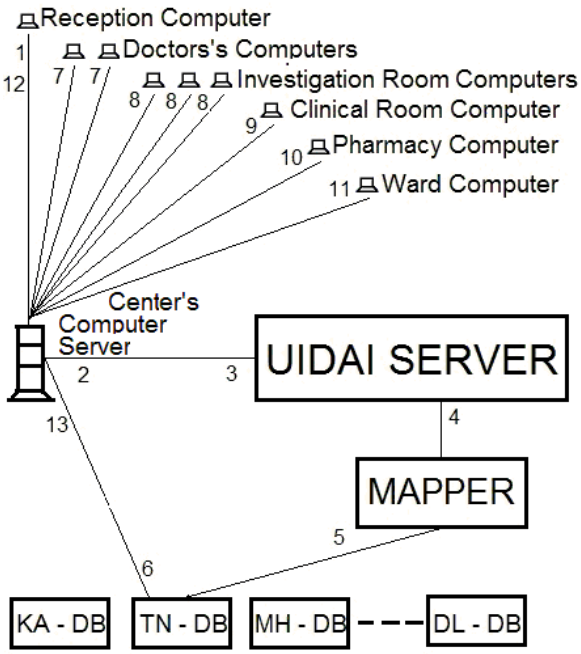



**Fig.4. Network of Health Service Center Computing Resources, UIDAI and State Medical Records Databases**

## IV. SEQUENCE OF EVENTS FOR DELIVERING HEALTH SERVICE ACCORDING TO PROPOSED SYSTEM

The sequence of actions that will needs to be performed for successful operation of the system is listed below

1. A patient approaches the reception of a health center and requests service. The receptionist requests for the patients Aadhaar card. Then scans the patient's finger print and sends the finger print to the health center's high end server (Number 1 in Figure 4).
2. The health center's high end server forwards the finger print to the UIDAI Server (Number 2 in Figure 4).
3. The UIDAI Server compares the received finger print to its database. If a match is found then, personal details such as picture, name, date of birth, sex (gender) and address of corresponding finger print is sent back to the requester (Number 3 in Figure 4). Using this information the receptionist can confirm the identity of the patient.
4. Unfortunately if the finger print is not found in the UIDAI database, then an Error message is send back to the requester (Number 3 in Figure 4) and the receptionist denies health care service to patient since he/she is not registered.
5. If the UIDAI server finds a fingerprint match (apart from sending to the requester, it also) sends a message to the MAPPER (Number 4 in Figure 4). This message contains the ID of the health center and the Aadhaar number of patient.
6. The MAPPER receives the message. Based on the ID of the health center (which also has the location information of the health center), the MAPPER locates the State Level Server that has the medical records of the patient. For example, in figure 4 four State data bases are shown (KA-DB Karnataka Database, TN-DB Tamil Nadu Database, MH-DB Maharashtra Database, DL-DB Delhi Database). Assume that out patient is from Tamil Nadu, the MAPPER determines that his medical records are in the Tamil Nadu Database server and sends a message to the Tamil Nadu Database (Number 5 in Figure 4). This message also contains the ID of the health center and the Aadhaar number of patient.
7. The Tamil Nadu database server receives the Aadhaar number of the patient and sends the complete record and information about the patient to the Health center (Number 6 in Figure 4) based on the health center ID received from MAPPER.
8. Now the patient's records are present in the health center's high end server. Since the high end server is connected to the computers in Reception, Doctor's room, Investigation room, Clinical room, Pharmacy and Ward. The patient is now free to move around the health center and his records can be accessed and modified in any location within the health center. For example

- Doctors can record symptoms, request Investigation and prescribe drugs. All of these will be sent to the patient's record in the high end health center server (Number 7 in Figure 4).
- Lab technicians can perform the investigation and enter the output directly to the patient's record in the high end health center server (Number 8 in Figure 4).
- Nurses can perform drug administration and other activities such as physiotherapy and update that information to the patient's record in the high end health center server (Number 9 in Figure 4).
- Pharmacist will distribute the prescribed drugs to the patient and, update the patient's record in the high end health center server (Number 10 in Figure 4).
- Unfortunately if a patient is admitted in a ward, his activities can still be monitored and recorded in the high end health center server (Number 11 in Figure 4).

9. Once the patient has completed receiving the health service, he approaches the reception for checking out of the health center. At this instant the receptionist sends a message to the health center's High end serer indicating that the patient is checking out (Number 12 in Figure 4).
10. The health center's high end server sends the Aadhaar number and the updated patient records (for that Aadhaar number) to the corresponding State Level Server from which the original record was fetched (Number 13 in Figure 4).
11. As a final step, The State level medical database server receives Aadhaar number of the

patient along with the updated medical records and then updates it database so that the Medical records are latest.

## V. IMPLEMENTATION ISSUES

Tasks needed to be performed to implement the proposed system

12. The health centers providing the service should be equipped with necessary number of computers and at least one high end server.
13. UIDAI Server is already up and running. Permission should be obtained from UIDAI to receive requests from the health centers and respond back to the requests to the health center and MAPPER.
14. A new MAPPER computer has to be developed and installed. Just a PC is enough. It should have a lookup table to locate the State level medical database according to the health center ID and forward the Aadhaar number and health center ID.
15. The toughest task is to integrate all the medical records of State's all residents into a single Database server. Once this is completed the system will be perfect.
16. Finally we need an infrastructure to connect all the distributed computing resources, which is very easy now day using networking technologies.
17. The staffs in the health centers have to be trained to use the computers to provide service to the patients. This obstacle also can be easily overcome by providing weekend crash courses to the staffs.

## VI. ADVANTAGES

The most important advantages of the proposed system are

18. Mobility – A resident of India can gain Health services anywhere in India just by scanning his finger and carrying his/her Aadhaar card.
19. Rapid access to Information – The pervious system had patient records stored in Medical record room, hence searching for patients records may take long time or even be impossible. In our proposed system, the records will be available in the computer almost instantly.
20. Security and Confidentiality - Since the records are store in a State Level Database it can be made secure to provide confidentiality and security.
21. Environment Friendly – The proposed system will replace all the paper base medical records. Thus the proposed system will not use paper and will be environment friendly.
22. Emergency Disasters – In case of accident, the identity and the medical history of the victim can be fetched by just scanning the finger print. The most notable advantage is that the victims need not be conscious for the finger print to be scanned.
23. Data Mobility – If a resident of one state move to another state permanently, he does not need to carry his records. His medical records can be moved from one State server to another State server instantly.

## CONCLUSIONS

A novel e-Health system for India based on Aadhar authentication was introduced. The computing facility that needs to be appended to an existing system was discussed. Sequence of events that need to be performed to achieve the health service was explained. Suggestions to implement the system were also provided. Finally, several advantages of the proposed system were listed. The ease of implementation and advantages of the proposed novel system make the system a promising one.

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