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An automated cloud-based digitized management system for Rohingya refugee camp in Bangladesh

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***Abstract*— Owing to the recent increase in the number of shelter-seeking migrants and the growth of the worldwide refugee crisis, bringing this huge influx of refugees under a single system is necessary for the proper rehabilitation of these migrants. Presently in Bangladesh, Rohingya refugees arrival is a major crisis and there is no fully-developed centralized automated system here for this purpose. This paper delineates a digital system developed for the organized registration, documentation and conduction of the tedious task of refugee management. It introduces a system which aims to harmonize this task through the use of a cloud database that incorporates all the necessary information regarding the migrants.**

***Index Terms*—Automated System, Cloud Database, Data Security & Integrity, Rohingya Refugee Camp Management System**

I. Introduction

The Rohingya are a largely Muslim ethnic minority in Myanmar [1]. They are without citizenship by birth as they were not included in the nation of Myanmar [2]. Thus being deprived of all rights of a citizen. As of December 2017, an estimated 7,00,000 Rohingya refugees have taken shelter in Bangladesh border [3]. This sudden arrival of refugees have made it tough for the Bangladeshi government to handle the situation. The Poverty rate in Bangladesh is 12.9 percent [4]. Since maintaining the refugees is backbreaking in perspective of the economy so an organized system will help the country to provide the facilities in a sorted manner. Bangladesh Government needs to keep a record of the basic information and some other details of all these migrants. Since they are large in number, a cloud-based automated system along with a well-structured database is required to manage genuine records of Rohingya taking shelter in Bangladesh. At present entries are maintained manually which provide a scope of mistakes and data can easily be plundered. As it hasn't been possible to come up with a proper centralized management system yet, mismanagement prevails.

The goal of the implemented proposed system is to provide an unerring system that will help the country to maintain precise record of each refugee and the services they are given. This database will keep a record of each refugee's background, facilities provided and their accommodation. Thus, this Rohingya Camp Management System comes up with a convenient idea of serving the country in its crisis and also the forsaken Rohingya refugees. The rest of the paper is organized as follows: Section II presents the works in the relevant field, Section III demonstrates the present scenario while Section IV describes the conceptual and logical design along with the proposed database design. In Section V overall system architecture along with implemented system features has been described. Section VI discusses limitation and future expansion of the system. Finally, Section VII concludes the paper.

II. Literature Review

Rohingya have been in the face of humanitarian crisis since the past few decades. As mentioned by the NGO ISCG, 671,500 arrivals since August 2017 have been reported as of 15 March, according to IOM [5]. Rohingya camps are in 15 different locations namely Kutupalong, Balukhali, Moynarghona, Burmapara, Hakimpara, Thangkhali, Nayapara etc. across Cox's Bazar [6].

For lack of proper administration and an organized database of the refugees, Bangladesh is faced with more challenges along with its own struggles as a developing nation. According to Buzan, this is a humanitarian & moral issue, a security issue & a development issue [7]. From a security perspective, the Rohingya, as a group constitute a security threat to Bangladesh's state and society [8]. So, registration of this mass is very important. After the initial registration, government authorities will ensure that refugees hold provisional documentation attesting that an application for refugee protection has been submitted [9]. Without an organized registration system, the Rohingya are largely entering the local public illegally as Bangladeshi citizens. Often there are disputes between the Rohingya and locals over competition on jobs [10]. Day labourers in Cox's Bazar have lost their jobs due to oversupply of labour from the refugees, said Refugee Relief and Repatriation Commissioner (RRRC) Abul Kalam [10]. According to "The Bangladesh Post", the 10 lac Rohingya from Myanmar are spreading crimes across greater Chittagong [11] and attempting to illegally gain citizenship [12]. Locals have concerns over how these extra people will impact their future [13].

A refugee-driven data management system has been described by Maitland where data is used in decision-making

[14]. Data is maintained in a server and accessible to the public. In a client-case study, the company Accenture presents their identity management system made for UNHCR that uses biometrics to implement the recording of undocumented refugees [15]. Over 120,000 refugees in 9 camps in Thailand were enrolled in three months, ordered by family groups, nationality, and family size [15]. Relevant to this work, the Govt of Uganda had also introduced a similar system, as stated by New Vision Daily of Uganda [16]. Their Government had launched a centralized database to track the response to immigrants in Uganda. The web-based software 'Refugee Information Management System (RIMS) helped trace refugees that no longer needed relief services [16]. Another website offers case-creation of refugees in a simple way that eliminates the duplication of applicant information entry [17]. Lastly, the Federal Office for Migration and Refugees had introduced an integrated refugee management system in 2015, due to the arrival of many asylum-seekers in Germany [18].

In Bangladesh, alongside the government and the army, other humanitarian and non-government organizations (NGOs) are contributing in the rehabilitation of the refugees. These organizations must work together to ensure that the refugees are given basic services. This can be done by sharing refugees' information or harmonizing beneficiary databases [19]. The last major Rohingya influx started in the latter part of August, 2017. Learning from the past influx, the government decided to register the Rohingya to know exactly how many migrants have taken refuge. Mr Abdul Mutaleb, former Director (Tech Services) of TigerIT mentioned that the government had assigned implementing this registration to Department of Immigration and Passport (DIP) who eventually handed the project to TigerIT. The company thought of identifying the refugees uniquely by introducing Biometric enrollment but this system wasn't very helpful as it wasn't a centralized system and there were data redundancy.

Introducing an automated system for the management of the refugees will help overcome these hurdles.Aid collection and distribution of donations will be handled, competition among labourers over jobs will be diminished by allowing certain employment opportunities to the registered Rohingya and they'll no longer be able to use fake identities or gain citizenship illegally. This system has been structured on the basis of the needs and the database has been designed to carry out data retrievals related to Rohingya such as photo-identity and previous location in Myanmar, current accommodation, information related to crimes, population per camp, camp-wise management etc. The main feature that separates this system from the others is that the whole system would be maintained centrally instead of individual terminal based system. In addition to that, the system will be fully-automated in contrast to the manually maintained system used at present.

III. Present System

Presently the Rohingya management process is handled manually and is employee dependent. Keeping records of individual Rohingyas, their location, current occupation and

Fig. 1: Keeping record in present system

wages, account of donations provided by different organizations are done manually. Even the Government and authority get the necessary update from them. This not only puts the employees under pressure, but also increases chances of mismanagement and mendacity. It is quite tedious for the Government organizations and NGO's to provide food, shelter, sanitation, security in camps since there is no central system for all the contributors to coordinate through. The current system is weakly structured, primarily to facilitate just the registration of the incoming refugees.There is a lack of consistency between the data collected by different organizations. Besides, the records kept in black and white are prone to manipulation.

This disarray in the management of data results in little to no opportunity for proper conduction of this population. The way the present system is running, there is every possibility for duplicate entries, causing data redundancy.Maintenance of data consistency is also problematic since individual copies of the data are manually updated each time. Also, it is quite easy to lose track of any Rohingya and taking advantage of that, many Rohingyas are taking up fake identities. Assigned by Government, TigerIT implemented a management system for the Rohingya camp. Enrollment was done using independent laptops (up to 100); the number of enrollment stations was 7. The reference Figure 1 of the enrollment page was taken from the existing enrollment system. Mr Abdul Mutaleb stated that the idea was to accumulate all records in a portable storage device at the end of each day to import in the DB server at Coxs Bazar DIP data-center. Using the DIP network, the records would be transferred to another DB server at DIP data-center in Dhaka where the distinction process would find out duplicate records; after this, the records would be sent to DIP main DB blacklist to prevent issuing passports to enrolled Rohingya. The main drawback of this was that there was no central server to store the data from the field level. Therefore, implementing the proposed system with a centrally maintained database will reduce dependency on employees immensely.The system itself will keep track of all

the Rohingyas and will be able to convert the present manual management process into a fast automated one.

IV. Proposed System

For developing the concept of the database management system a visit was made to the Rohingya camps in Cox's Bazar. Thereafter analyzing how the data is kept by the different organizations, the overall system was designed and implemented.

A. Conceptual Design

The primary stakeholders of the system are the Rohingya refugee populace, the Government (including the military and security forces) and various NGOs. The primary beneficiaries of the system would be the DIP and various NGOs operating in different territories. This system would house information regarding Refugee Registration, Camp-wise distribution of Rations and Relief, calculation of various maintenance costs and also keep a track of the different services provided by various organizations. The main focus points were:

- Ensuring proper distribution of relief goods and aids received from national and international sources.
- Cost management and allocation of camp-wise budget.
- Unique identification of each refugee.
- Keep record of number of employees from security organizations.
- Keep record of Health Conditions and Crime activities.
- Keep track of previous residence and occupations in case of repatriation.

The overall conceptual design has been explained in Figure 2.

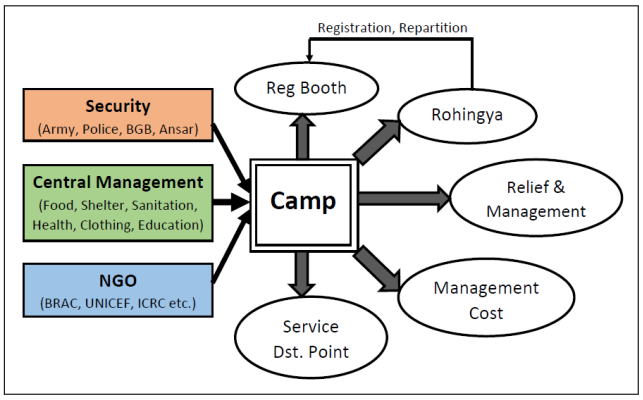

Fig. 2: Design of Rohingya Camp Management System

B. Logical Design

Based on the conceptual design, the database was designed to handle versatile types of data using various interconnected tables as shown in the ER diagram in Figure 3.

V. Implementation of the System

The overall system architecture of the implemented system has been depicted with the help of Figure 4 which indicates the user roles and functions of the system. An overview of the implemented system has been discussed henceforth.

A. Implemented Features

1) **Actors of our System:** There are five types of users.
   i Admin
   ii Department of passport and immigration (DIP)
   iii NGO
   iv Management Department
   v Security Management Account
2) **Register & Login:** At first a user can register/login with a unique user-id to have access over different features. The user login is approved by the admin.
3) **Search:** They can search for a Rohingya using personal ID or name. Search results can be grouped according to the camps.
4) **Personal Info View:** Figure 5 shows how basic information of Rohingyas are shown in the system. Data is restricted based on the type of users. This feature can be really helpful for the refugees if they get lost or want to find any of their family members.
5) **Repatriation of Rohingya:** As all the Rohingya are registered with a unique personal ID, their previous and present address, there will be no duplicate entry. When a Rohingya is moved, his/her records can be transferred to the Repatriated list.
6) **Admin Account** The database admin has access to all the information. Approval of a new account, alteration of user's access permission, updating user information and maintenance of the overall database is his job.
7) **DIP Officer's Account:** User logged in under the DIP has access over following features:
   i Registration of Rohingya
   ii Basic Rohingya Information Update
   iii Assigning Rohingya under a Majhi
   iv Viewing Enlisted Rohingyas' information
8) **NGO's Account:** NGO workers are the management level users. They will have access to features required to ensure distribution of the relief goods and health support.
   i *Rohingya Health Record:* The detailed health profile of every Rohingya is maintained in this section.
   ii *Cost Update:* There are five categories of services provided by the NGOs.All necessary calculations regarding cost of these services and updates is to be done by the system itself.
   iii *Requirement maintenance:* NGOs keep the list of requirements of the Rohingyas updated so that the service flow runs smoothly.
   iv *Food-Age Group:* Rohingyas are divided into age groups for ration distribution. The system classifies each Rohingya into his applicable age group so that he can enjoy facilities for that particular age group.

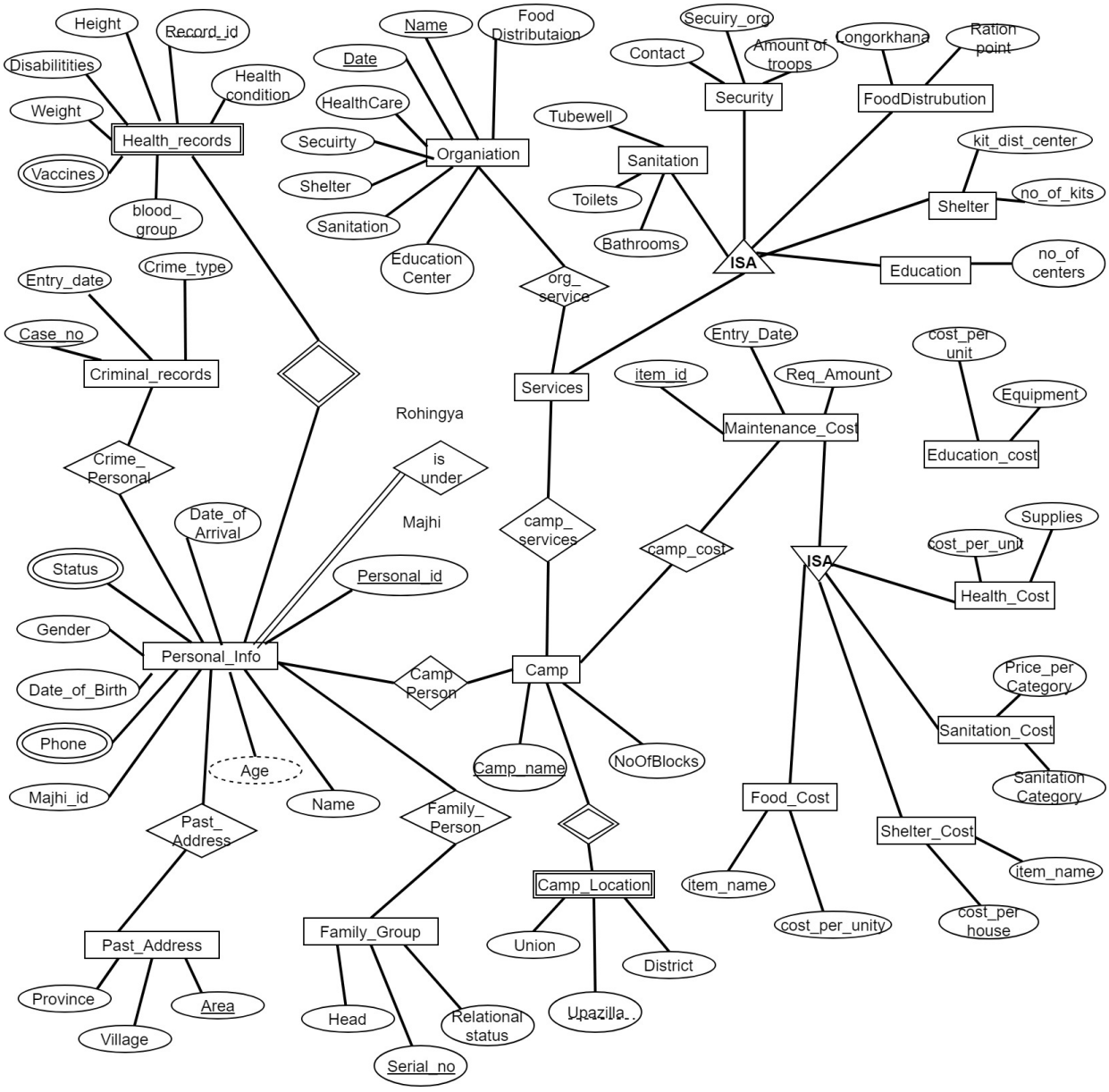

Fig. 3: Entity-Relationship Diagram of Rohingya Camp Management System

9) **Management Account:** This account holder can view all the lists camp-wise and distribute the facilities. Armed Forces or DIP will have access to this account.
   i *Camp-wise central cost management:* Relief is distributed in camps according to the demand of each service.
   ii *Camp-wise distribution point management:* Collecting feedback from the distribution points of the camps, this feature allows the management authority to closely monitor the dire need of Rohingyas.
10) **Security Account:** Security organizations such as Army, Ansar and VDP, Police and BGB will have access to this part of the database and their responsibility will be:
   i *Keeping and Updating Criminal Records*
   ii *Deployment of Troops in camps*

B. System Requirement

Oracle database has been used to store data and Oracle Cloud for remote access which uses MD5 message-digest encryption algorithm. To implement this project on a national scale number of resources are required such as a secured server, website and a technical support team. Along with these, some hardware installations are also required. At least five registration booth should be set up in every camp which will maintain the registration process. Each registration booth will be human-operated and will require one laptop connected to internet. There will be two service centers in each camp from

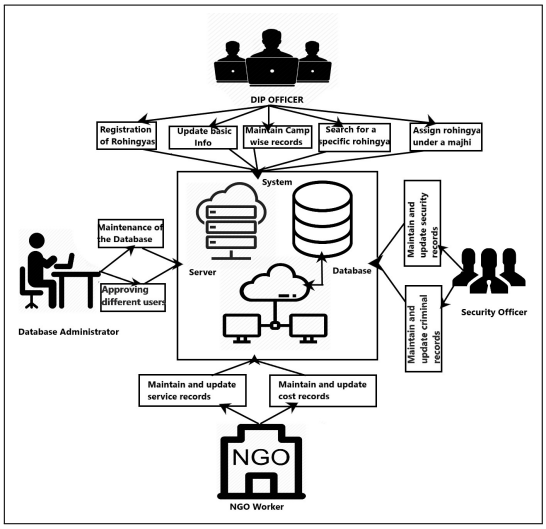

Fig. 4: System Architecture

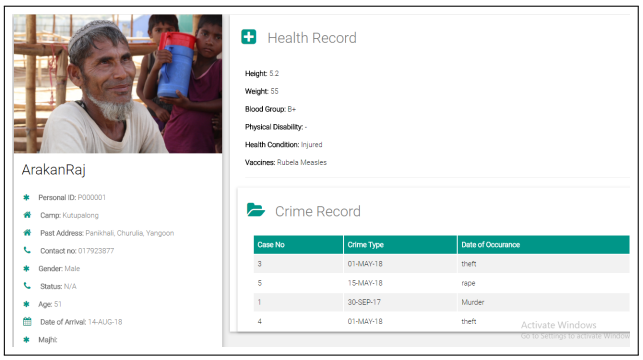

Fig. 5: Personal Record of Rohingya

where the Rohingyas will receive the services and the NGOs will have its own booth in there. If this system is setup on a large scale it will take less than two weeks to register all the Rohingyas. Government can get immediate results from this as the proposed system is very feasible to implement practically and they can also employ human resources for this purpose and gain economic benefits.

VI. Limitations and Future Expansion

Some of the key limitations of our system are:

- For registration of Rohingyas, bio-metric identification is not available in this system which could make it more countable and trustworthy.
- A big drawback of this system is that this database mainly works to meet the needs of the management rather than the Rohingyas themselves. This gap needs to be bridged.

In the long run, with little modifications, the system can be converted into a universal refugee management system so that any country can use it to manage the refugee camps.

To make the system more reliable, bio-metric identification will be added to the system and fingerprints, retina and iris scan will be taken of each individual refugee while registering them in the system. One of the main tasks is to make this database efficient not only for the management level but also for the refugees themselves so that they get proper support.

VII. Discussion and Conclusion

It is an inevitable fact that by accurately recording data, updating and tracking them on an efficient and regular basis, the challenge of properly managing the Rohingya situation can be addressed in a systematic way. Since the current system is completely paper-based, the provided data are inconsistent and hard to retrieve. Our system solves these problems by providing a cloud database and centralized web-based environment for the end users to have better access to more systematic and correct data. If implemented and maintained legitimately, this system will be able to help the government organizations, NGOs and international agencies work more professionally with the ultimate goal of accelerating the development of the refugee rehabilitation and will also be of great help to the refugees themselves.

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