Cloud Computing Based Framework for Blood Services

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Abstract

A web application for efficient management of various blood banks and donor-recipient operations is being focused. The paper includes a central repository of information about various blood groups and its available donors along with their details, hosted on a cloud server. These details include donor name, blood group, medical details and location details. It also provides an option to search and find whether a particular blood group is available in any of the nearby blood banks or among the registered blood donors using cloud server. Search results will be listed based on the location of the requestor, ie, the nearest donors and blood banks. The system generates and sends mails requesting blood to the selected donors, based on donor response and given preferences, the system will provide the personal details, contact information and directions (using Google Geolocation services). Moreover, the system will have added features such as posting blood campaign invitations on the dashboard and showing live blood requests as a popup notification on the homepage. This online life saviour system is developed on PHP with Azure cloud platform and supported by MySQL database.

Keywords: Blood bank, donor, GPS, blood group

1.   INTRODUCTION

Blood is a specialized body fluid. It has four main components: plasma, red blood cells, white blood cells, and platelets. Blood has many different functions, including:

- transporting oxygen and nutrients to the lungs and tissues
- forming blood clots to prevent excess blood loss
- carrying cells and antibodies that fight infection
- bringing waste products to the kidneys and liver, which filter and clean the blood
- regulating body temperature

The blood that runs through the veins, arteries, and capillaries is known as whole blood, a mixture of plasma and red blood cells. About 7 to 8 percent of the total body weight is blood.

Blood requirement in any emergency situation is satisfied by the blood bank itself. And this blood is compensated to the blood bank by the recipient's relatives or friends. This is because every blood bank needs to maintain certain units of blood for every blood group. Though, rare blood groups such as Bombay group and AB- are not kept in blood banks to avoid any wastage, in case it gets expired. Hospitals keep the record of people with rare blood groups. But this is kept in extreme secrecy to provide privacy and security to them. Rare blood emergencies are met by directly contacting these people, and no more than the necessary units of blood required is collected [1].

A medical emergency is a severe injury or illness that poses an immediate risk to a person's life or long-term health. Any response to an emergency medical situation will depend strongly on the situation of the patient involved, and availability of resources to help them. Every hospital that handles accident cases and has operation theaters will have an integrated blood bank of itself. Trained medical professionals can give first aids and emergency care to the patient within the bounds of the knowledge they have, while waiting for the next level of definitive care. But hospitals cannot or should not proceed to assist patients that may need any blood transfusion during treatment. Emergency cases arriving at a hospital, without a blood bank, is forwarded to any of the hospitals which have an integrated blood bank.

Suppose there is some patient who needs blood urgently. Then, how would you handle this condition? Sometimes you will not be able to reach that patient on time even if you wanted to. People will go from one blood bank to another in search of blood, which will be time-consuming, and in worst cases they may not be able to reach on time. If a person wants to donate blood, he/she will have to come to the blood bank and fill a form. Then, a nurse/doctor will check his/her blood group and health conditions, only after which he/she is allowed to donate. All these situations are very time consuming. As we mentioned, blood banks keep certain units of blood for every blood group. Maintaining this limit consistently eliminates the need to go for a blood hunt during an emergency situation [2]. This can be achieved by compensating blood as soon as it is used from a blood bank, and by keeping and maintaining an efficient database of blood donors who are willing to donate blood periodically, as well as when called for will solve this crisis.

2.   OBJECTIVE AND SCOPE

The main objective of this cloud computing based web application is to help satisfy a blood request made from anywhere and anytime, by maintaining all information pertaining to the blood donors and different blood groups available in each blood bank. This system provides transparency in this field, ie, makes the process of obtaining blood from a blood bank, corruption free and makes blood bank management effective. The system intends to make the blood search process much more efficient and quick. Therefore, no permanent registration to the website is needed for the requestor, they are only required to provide their basic details and contact information for verification. The search result is

filtered and ordered in such a way that donors nearest to the requestor are listed first. This system also keeps records of patient details and blood booking history. Need for certain blood groups is posted on the website to find available donors for a blood emergency [3]. This system is developed on Azure cloud using the PHP platform and supported by a MySQL database to store blood and user specific details. This web application, along with all the services it provides, also helps to eradicate certain spam messages and mails circulating around regarding fake or already satisfied blood emergency situations [4]. A single platform for maintaining all genuine blood related activities and information increases the trust of the public to get involved in these activities, and to participate in blood donations.

3. EXISTING SOLUTIONS

There are some sources that provide an online platform for blood donation:

American Red Cross Blood Services

The website is owned by American National Red Cross Society which is a well renowned organization for health services. [5] This website can be used by individuals who are willing to donate blood. They conduct blood drives to collect blood from donors and distribute it to the needed blood banks. They collaborate with various events like Superbowl to avail offers to the people donating blood. This website also gives provision to the user to conduct blood drives and we can also register to be part of their activities as a volunteer. But they do not provide the option to perform an emergency blood request even though that is a vital part of the whole process.

Blood Bank India

The website [6] provides various facilities like searching availability of blood, donor registration, and requesting blood. Latest requests are shown when one opens the website, the recent donors are also referred. The website does not provide accurate location based search results and hence it will not be a reliable source in every scenario. There is no integration with blood banks. Any random user can obtain the contact details of donors without any steps of verification, and legitimacy of donors are not verified.

e-RaktKosh

e-RaktKosh is a Centralized Blood Bank Management System [7]. It is an initiative of the Ministry of Health and Family Welfare. It provides details about blood banks all across the nation. The details include the availability of each blood group. But the information provided is not accurate. They also provide contact details and location information about blood banks.

4. PROPOSED SYSTEM

The conventional time-consuming process of blood services can be eliminated by maintaining the minimum units of each blood group in the blood bank, consistently. To achieve this, our web page maintains a database to store the details of donors who are active and quickly respond to the blood requests

fig 4.1, and this database is updated consistently. Our website makes use of this database to locate and find the nearest donors in case of emergency blood requests. The details of the donors are kept private and their security is ensured. The details are available to the requestor only after it is verified that the request is valid and legitimate. The entire process can be explained in detail by dividing our web page into 3 modules, namely, Registration, Request and Administration as shown in fig 4.1.

4.1 Registration

Registration module consists of procedures for donor registration, blood bank registration and requestor registration. A donor can register to the system either as a verified donor or as a non-verified donor. Non-verified donors create their account by providing their blood group, age and basic contact details. They will get notifications about blood donation camps conducted near them and by donating blood in these camps, their account can be verified by the administrator. Another method to get the account verified is, by submitting a valid doctor certificate which can be considered as a proof of eligibility to donate blood. During the registration procedure location information of donors is collected inorder to perform efficient search for nearby donors when a request is made. Anyone making an account can enter their home location either by manually pinning it in the maps provided, or we can obtain the accurate location by accessing the GPS feature, which is the passive location. Once the request is accepted by the donor, he will be asked permission to share active location via GPS, and then the current location of the donor is forwarded to the requester through the request confirmation mail. When registering a blood bank, basic details like name and contact details have to be given and certification details need to be produced to verify the blood bank. Blood banks need to mention whether there is a hospital integrated with them or not. Particulars of blood available in the blood bank is also collected during the registration procedure. Blood banks must also provide their location information. When a requestor registers his blood requirement in the portal, he needs to provide necessary contact details. The requestor also needs to provide a valid doctor certificate to prove the legitimacy of the request. This verification ensures that sensitive data about the donors are not disclosed to malicious users. Thereby ensuring privacy of the donors.

4.2 Requester

Blood requests can be raised either by blood banks or by individuals. If the requestor is a blood bank, the procedure is much simple. Since blood banks are already our registered users, the system directly processes the blood request and forms a result that contains donors with the searched blood group. Now the system will send notification to all the selected donors and record the donor response. If the donor response is to accept the request, blood requirement is satisfied and the requestor and donor can contact each other. Then a request is rejected by a donor, we will wait for the response from other donors and if no one accepts the request, the system will inform the requestor to make a new query with another set of selected donors. When

the requestor is an individual, the system has to verify the request to ensure that the requestor is genuine. When an individual login to the system, his name and contact information are mandatory. and we use OTP verification to authenticate the request. Inorder to validate the request, the individual has to submit a valid doctor certificate. The doctor certificate can be verified by either the administrator or a verified donor. If the user tries to misuse the system or provide fake documents the individual will be temporarily blocked with prior warning.

4.2 Administrator

Administrator is responsible for verification of requests and donor accounts. Verification is done by validating the documents uploaded by the users. Notifications about blood donation campaigns sent to users are managed by the administrator. The system also provides a search facility to search for the availability of a particular unit of blood in that area, without providing information about donors. Administrator is responsible for maintaining the log of the blood requests satisfied through the system. Donor accounts which are inactive for a period of about six months should be deactivated with prior warning inorder to make sure that search results for requests will list only active donors. Administrator provides donors with the privilege to report fake requests, and the respective requestor will be temporarily blocked by the administrator.
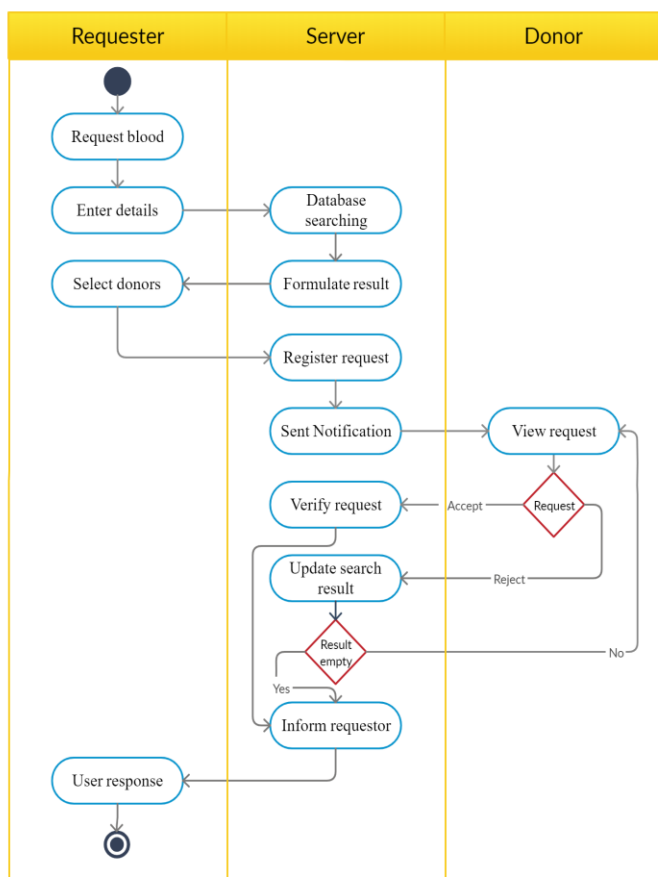

Fig 4.1: System architecture

5.   CONCLUSION

Witnessing someone desperately searching for a blood donor, when a particular blood group is unavailable in the blood bank and the donors in mind are out of reach, is a painful and helpless situation. Losing a life just because a donor was not available at the most needed moment is an unbearable experience. Our mission is, to fulfill every blood request in the country with a promising web portal and, try to motivate individuals who are willing to donate blood. Our idea of a cloud-based blood bank management system solves most of the key issues existing in this sector. Blood units may be present in the blood bank and the requester may not be aware of it, then it is of no use. Our system prevents such situations, as every requester will be able to know about the blood bank and blood units available nearby. The GPS technology will be used to make the nearby blood bank and donor location visible to the requestor. All the services are done by keeping in check the extreme privacy and security of the user information. By providing the public with a single platform for all blood related services and information, we hope that the people will develop confidence and trust to get involved in these blood services. More the people who participate and use the system, the more efficient the system becomes. The system creates a direct bridge between the donor and the recipient. The health sector will be definitely benefited by the services provided by the system as the patient's safety and life is considered valuable.

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