echildcare: Innovative SMS and Web-based Alert System to Improve Children's Health

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Abstract: After the birth, a child has to be given various vaccines for preventing deadly diseases. But the problem is that either the parents are not aware of these vaccines or they don't remember the proper schedule. With this platform, we are trying to solve problems at the grass root level. The idea of our platform is to register the newborn child to our platform through SMS and then send notifications about the upcoming vaccination schedule based on the Date of birth of the child to the registered mobile number through SMS. The notifications are sent in few days advance as well as on the date of the event. In this way, the parents are aware of the various schemes as well as their proper schedule.

In India very large population still doesn't have access to the internet. The maximum percentage of the population has access to SMS. Also, the chances of a user checking an SMS are much higher than checking an email. Using SMS helps in reaching large population and an instant reachability. Our platform can be used in a wide variety of applications like Healthcare, Birth Registration, collecting essential data, spreading information etc. The proposed platform has been sent as a proposal for Digital India project through mygov.in. Our platform is built using open source technologies and the code is available on GitHub at https://github.com/Parbhat/echildcare. The online repository on GitHub includes the following:

- The complete code of echildcare platform for reading and modification.
- Features of echildcare platform.
- Instructions for setting up the platform on a local machine for development.
- Instructions for setting up celery for local development.
- End User Instructions.

Keywords: python, Django, celery, RapidSMS, Healthcare, vaccination, Digital India, open source, SMS, child health.

I. INTRODUCTION

echildcare platform is focused on improving children's health. Government launches many schemes for child care, like Navjat Shishu Suraksha Karyakram(NSSK), Janani Shishu Suraksha Karyakram (JSSK)[11] etc. But due to lack of information people are not able to take their proper benefits. It leads to a poor health of the child. This problem is common in villages, where the Internet connectivity is not very good. Awareness about these schemes will lead to a better health and take vaccination on time will protect the child from many diseases. Our platform tackles this problem by using SMS for notification. Also, our platform provides the option for email notification for the places with proper Internet connectivity.

The Government can also use our platform to inform its citizens about its policies, development, medicines in case of new diseases. A user can register to our platform through a simple SMS. The SMS sent by the user is validated by our platform. If some error is found in the format of the SMS, the platform will send a reply informing the user about the correct format. The user can add optional information like name, gender, city, pin code along with the required information. The platform also provides an admin panel with a web interface.

The scope of our platform is not restricted only to this field. It can be used in any other sector like education, advertisement etc.

Technologies used in our platform are as follows:

A. Python
Our platform uses Python programming language. Python is a high-level programming language like Java. It is very easy to read and simple to implement. It is a free and open source programming language and can be used freely even for commercial applications. Python can run on Mac, Windows, and UNIX systems and has also been ported to Java and .NET virtual machines. Python is considered a scripting language, like Ruby or Perl and is often used for creating dynamic Web content and Web applications. Python is simple and incredibly readable as it is somewhat similar to the English language.

B. Django
Our platform is built using Django web framework. Django is free and open source web application framework. It is written using Python programming language. Every web application requires certain fixed components. Django provides these components as a base on which we can build upon[1]. Some of the key features of the Django are that it is fast, it is easy to use, it is secure

and scalable, it has built-in authentication, admin panel and can be easily integrated with popular databases.

C. RapidSMS

RapidSMS is a free and open-source framework for rapidly building SMS applications. RapidSMS is built with Python and Django and is designed for building robust customizable SMS applications. It also provides web-based dashboards [2]. RapidSMS provides a flexible platform and modular components for large-scale data collection, managing complex workflows and automating data analysis. Our platform uses RapidSMS for integrating SMS functionality. It has also been used in Designing and Implementing an Innovative SMS-based alert system (RapidSMS-MCH) to monitor pregnancy and reduce maternal and child deaths in Rwanda[3].

D. Celery

Our platform requires certain functionalities to be executed repeatedly after a fixed interval. We are using Celery to perform the same. Celery is an asynchronous task queue/job queue based on distributed message passing. The execution units, called tasks, are executed concurrently on a single or more worker servers using multiprocessing[7]. It is focused on the real-time operation but supports scheduling as well. Tasks can execute in the background or synchronously. Celery is used in production systems to process millions of tasks a day.

E. Redis

Redis[9] is an open source Database, in-memory data structure store. Redis is a Key value store meaning is primarily designed to store data using a Unique Key.

Redis stores data in-memory, it stores its data in the RAM of the computer is running on so it is extremely fast. Redis supports data structures such as String, Hashes, Lists, Sets Sorted Sets, Bitmaps, Hyper logs and Geospatial indexes. Redis is being used by our platform as a message broker.

F. PostgreSQL

The information received from the user is stored in the database by our platform. Our platform uses PostgreSQL database. It is the recommended database for Django web framework. PostgreSQL, often simply Postgres, is an object-relational database management system (ORDBMS) with an emphasis on extensibility and standards-compliance. It is highly scalable and can handle workloads ranging from small single-machine applications to large Internet-facing applications with many concurrent users.

II. IMPLEMENTATION

The echildcare platform is aimed at common people and hence, it should be easy to use. The user requires the only SMS to interact with the portal.

The portal also has a user-friendly admin panel with a web interface. echildcare platform uses RapidSMS at its core. The following figure (Figure 1) shows the architecture of RapidSMS[10]:
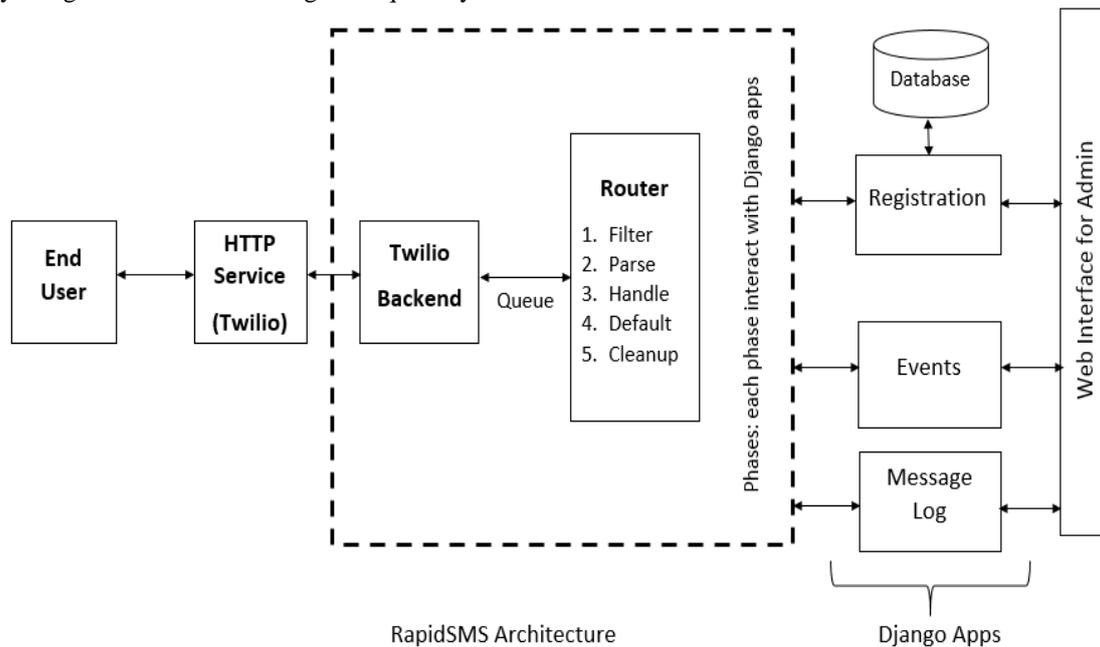

Figure 1: Proposed Architecture for echildcare

To initiate the process user sends SMS which goes through RapidSMS. The RapidSMS application can be connected with various interfaces and backend. We are using Twilio backend in our application. The backend receives messages from the user and also sends from our platform to the user mobile number. The router processes the incoming messages. The Router glues together our application and backend. Based on the keyword entered by

the user in the SMS, particular keyword handler functions will be called. For example, if the SMS contains the keyword "Register", Register keyword handler will be executed. The SMS sent by the user is first validated and if any error is found the registration text, the system will send instructions regarding the registration method. Once, the user is registered successfully, the user will get automated notifications.

The events app in the platform is responsible for sending notifications. There are two types of events in our platform:

A. General events

General event covers vaccinations and medicines that every child should be given after a certain age. The platform checks the registered children's on a daily basis using celery and sends SMS notifications to the eligible children. For example, DTP (Diphtheria, Tetanus & Pertussis) vaccine is given after 6 weeks of the birth of the child.

B. Scheduled events

Events are scheduled on a date and children that are under the event criteria are called to the event.

For example, Polio vaccine camp is to be held on a certain date in an area, then the admin can create a new event and all the children of a certain age group for that event will be notified about the event.

For the automation, the system uses Celery for creating periodic tasks. The Periodic task would be executed repeatedly after a particular interval of time for example, once in a day. The send SMS task will select children's eligible for any event based on the date of birth and will send SMS on the registered number about the event. Event's which are already finished would not be checked by the system as they get deleted automatically. The following figure (Figure 2) gives an overview of the flow of information between the user and our platform.
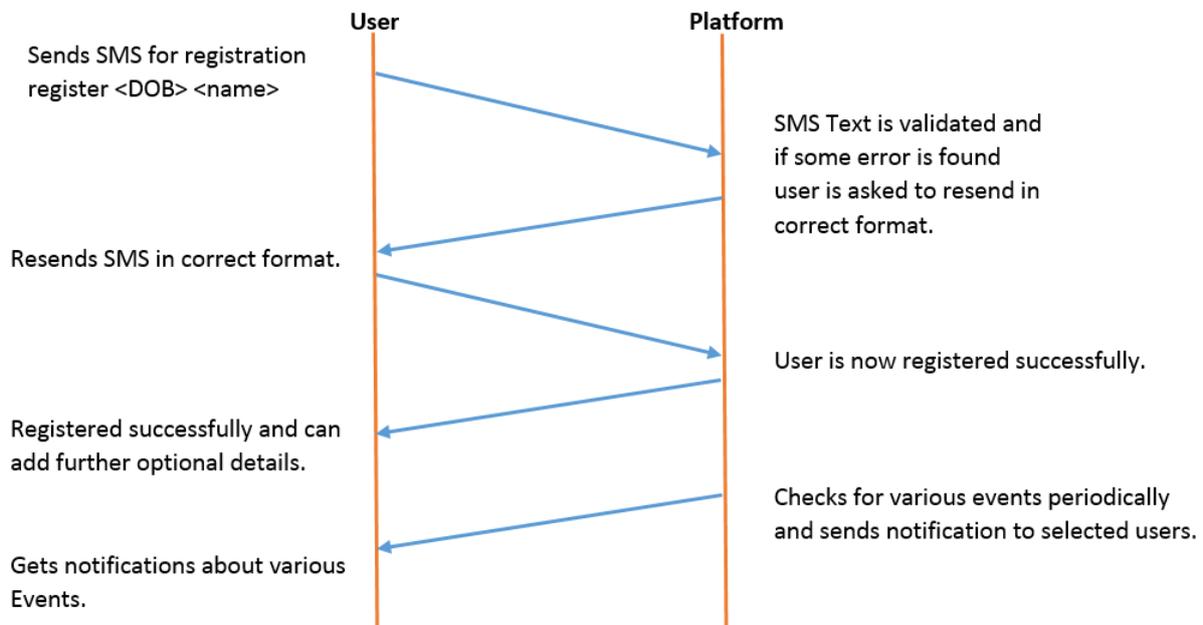

Figure 2: Flow of Information between user and our platform

When users are interacting with the application through SMS, they can start by sending the command register. Then they will receive further instructions as shown below:

register
Thanks for showing interest in echildcare.
To register, send JOIN <DATE OF BIRTH OF CHILD
like YYYY-MM-DD> <MOBILE NUMBER FOR RECEIVING INFORMATION>
Example: JOIN 2015-04-24 9*********

join 2014-04-24 9*********
Thank you for registering your child with
echildcare born on 2014-04-24. Now you will
receive notifications on 9*********. You can
also add more information if you like. Just send
email, gender, language, name, pincode from your
registered number. Example: name pappu

And if they send in the wrong format, they will receive instructions to send the correct data:

join 2014-24-04 9*********

Please register in the correct format. Example: JOIN 2015-04-24 9*********

If the user sends the email in the wrong format:

email xyz

Please enter E-mail in correct format.

If user tries to add name from an unregistered number:

name pappu

You must JOIN or REGISTER yourself before you can set your child name

The registered users can also unsubscribe from the service:

stop

You have successfully unsubscribed from

the echildcare service. To register again

send REGISTER

III. APPLICATIONS

A. Healthcare

The proposed system can be used in the field of healthcare to spread awareness about various government policies and for sending automated customized notifications for each individual.

The user can register to the application by using either of the two ways i.e. by using web portal or using SMS. The user will get the notifications for general events like regular vaccination schedules automatically according to the date of birth of the registered child. Further, a new event or information can also be added by the admin which could also be notified instantly to the registered users. This could control the health problems caused due to lack of information and negligence of parents, especially in villages.

B. Birth Registration system

This system can be used by the Hospitals and parents for birth registration of their newborn child's. This could help to get the exact details of child and would reduce the document work and delay involved in registration. This information could further be used for various applications.

C. Demand Analysis

The system would give the details of the exact quantity of each vaccination required in a particular region in next few months. This would help in keeping a check on the supply of medicines as the medicines will be ordered based on the requirements. Also, this would reduce the wastage of life-saving medicines and vaccines. The system tells the demand in advance hence requirement can be fulfilled on time. Money can be saved as the government has the record of medicines required in a particular area.

D. Data Analysis

The data collected through this application can be analyzed and various useful information can be derived from it. Information about sex ratio, population count, birth rate etc. can be easily derived with high precision. Further, the system can be customized to get more information. Data can be exported to Excel sheets so can be used in local medical centers.

IV. CONCLUSION

The echildcare a ready to use the platform and can be used by the local and central government. It is equally effective in various other sectors as mentioned previously. This platform is highly customizable and can be customized according to different requirements. Information is right of every citizen and it should be provided to them in the easiest way.

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BIOGRAPHY

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