

Software Requirements Specifications
For the
Real-Time Biosurveillance Program (RTBP)
Information Communication Technology System

IITM's **Rural Technology and Business Incubator (RTBI)**,

ESB #331, Indian Institute of Technology Madras (IITM), Chennai – 600 036
Website: www.rtbi.in



Authors: **T. Kannan and R. Sheebha**

Revision History

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1. Overview

These days most of the people own mobile phones and use it predominantly for voice communications but the mobile phone is also emerging as a ubiquitous tool for data collection in ICT (Information and Communication Technology) system. The goal of the RTBP is to collect the rural health data through mobile phones and to be uploaded in to a centralized server. The ICT system collecting the data through mobile handhelds uses General Packet Radio Service (GPRS) and Short Messaging Services (SMS). Using GPRS and SMS one can access the mobile application for data collection. The application is designed in a way with a easy to use and user friendly graphic user interface with redundant schemes such as using SMS in the absence of GPRS, a method to store the data offline if there are network issues, warn the user in the event of inadequate memory. by alerting the user and providing alternate actions.

Functional requirements have given rise to challenging design constraints that are a result of limitations on developing the applications using mobile devices. If we use high standard mobile devices (above USD 200) we may be able to overcome these limitations, but the only disadvantage is the high cost of the mobile device.

Following are the limitations of designing the applications using mobile device:

- Limited processing speed
- Very limited memory for application memory (JAR file) and heap memory
- Very low signals in Rural Areas
- Users may feel some difficulties to operate the keypad.
- Small screen size
- Cost of mobile phone should be around USD 100 affordable to rural folks
- Issues in Data Security
- It is not very user friendly
- GPRS is cheaper compared to SMS but SMS is more reliable than GPRS

2. Definitions, Acronyms, and Abbreviations

API	Application Programmer Interface
CDMA	Code Division Multiple Access
CLDC	Connected Limited Device Configuration
EDGE	Enhanced Data Rates for GSM Evolution
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communication
GUI	Graphical User Interface
ICT	Information and Communication Technology
IDE	Integrated Development Environment
J2ME	Java 2 Micro Edition
JAD	Java Application Descriptor
JAR	Java Archive
MIDP	Mobile Information Device Profile
PERL	Practical Extraction and Report Language
PHP	Programming for Hypertext Preprocessor
RMS	Record Management Storage
RTBP	Real-Time Biosurveillance Project
SMS	Short Messaging Service
UI	User Interface
USB	Universal Serial Bus
VHN	Village Health Nurse
WAP	Wireless Access Protocol
WTK	Wireless Tool Kit
PHI	Public Health Inspector

3. Functionality

The application has two parts:

- A client application runs in the mobile device (J2ME Application).
- The mobile application sends the data to standalone server using GPRS (WAP) and SMS services. Here the GPRS and SMS are very familiar techniques in data collection..

3.1.Functional Requirement: "Mobile Application"

The healthcare worker (ex.VHN or PHI) has to carry the mobile phone with health application installed, to the villages at the time of health visit. They have to fill the health survey form and send the data to the RTBP server through SMS/GPRS.

The Application has following functions,

1. Create a profile
2. Register locations
3. Download disease data
4. Health Survey
5. Offline survey

3.1.1.Real Need

1. Create Profile

- Acquire health worker user information
- The information are available in RTBP server as well Java RMS storage
- Attach a user name with submitted records for system to identify who sent record
- A single mobile phone to be used by multiple users

2. Register Locations

- Identifying the working locations of healthcare workers
- The information are available in RTBP server as well Java RMS storage
- Once they stored location they can select it in "Health survey form"

3. Download Disease data

- Reduce the typing of communicable disease in health survey form
- The communicable disease list (and its known symptoms and signs) are available in offline mode (stored in Java RMS)

4. Health survey

- This is the ultimate aim of RTBP project
- Acquire the health information from rural to find out the outbreaks of disease
- Identifying the patient information and sickness of disease
- In case signal or GPRS failed the survey information stored in Java RMS

5. Offline Survey

- Application has the capable of continue the survey in offline mode

3.1.2.User Goals

The following goals have to be achieved for developing the mobile application:

1. Healthcare workers wants to able to create, edit and delete their profiles
2. Single phone has the provision to access the multiple healthcare workers profile
3. Healthcare workers able to create, edit and delete their locations
4. Give the popup menus instead of typing the value from keypad for reduce the keypad usability

3.1.3.actors & Roles

- Field Health worker
 - He/She carries mobile for health survey, fills the health survey form and sends to the RTBP server.
- Administrator
 - Monitor the overall server maintenance
 - Install the application in mobile and give it to Field health worker
- Filed Officer
 - Giving the training to the field health worker
 - In case of any problem, he will provide the support to the field health worker

3.1.4.Usability

1. The user interface must be GUI based.
2. The users are required to input the data from cell phone keypad
3. The User Interface consists of J2ME GUI components like Forms, Buttons, Canvas, Textbox, TextField, AlertBoxes and Lists.
4. User has the options to change the settings locally and remotely.
5. Reduce the typing option by giving support for select menus.
6. Enable the dictionary words

3.1.5.Design Constraints

The SRS document has been developed based on the requirement with assumption. Here each actor needs some requirement to fulfill the user expectations.

The following supports are needed for mobile phone,

1. Java (J2ME) Enabled
2. WAP 1.0 or above (Wireless Access Protocol)
3. GPRS enabled
4. SMS (Short Messaging service)
5. MIDP 2.0
6. CLDC 1.1

The following supports are needed for network,

1. 50% of Network coverage and signal strength in Rural areas
2. Services like GPRS, SMS
3. Network consistency and reliability for sending/receiving the data

The following components are needed for server,

1. Web server like Apache, Weblogic, Websphere etc.
2. Web services programming support like PHP, PERL, etc
3. Database support like Mysql, PostgreSQL, Oracle, etc
4. Mapserver or Google map for situation mapping
5. Kennal or SMSTools3 plug-in for WAP/SMS gateway
6. AT enabled Phone or GSM modem (USB/Serial port support)

The following tools are used to build the Mobile application,

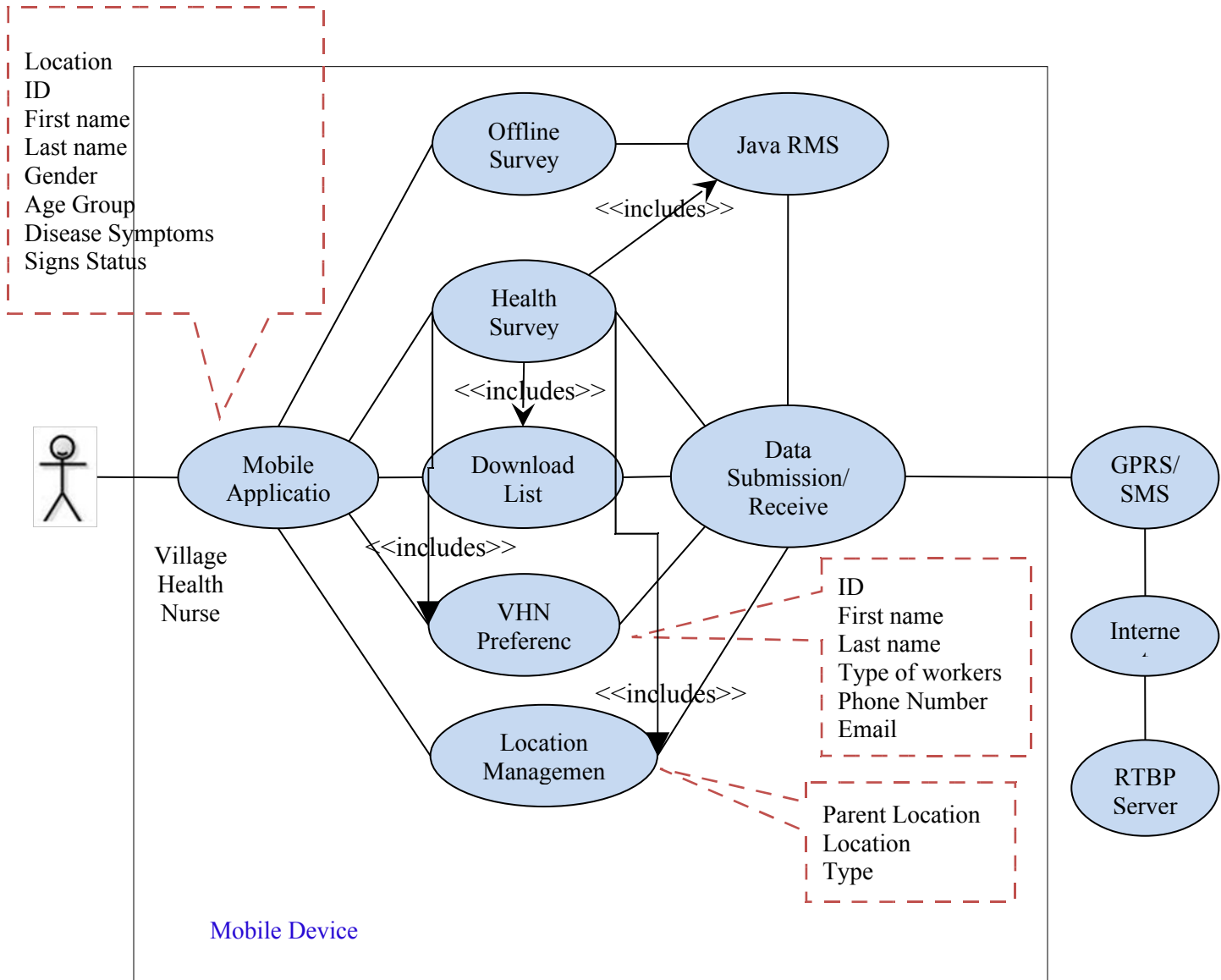
1. Java 1.4.1 or later

2. Wireless Tool Kit (WTK)
3. J2ME MIDP 2.0 and CLDC 1.1
4. Third party emulators like Nokia, Motorola etc.
5. Netbeans or Eclipse IDE
6. WTK optional packages

The following constraints have to achieve in the mobile application

1. User-friendly GUI form
2. Online and offline health survey
3. Application should be platform independent for Java enabled mobile.
4. Application must have security
5. Health Application can be developed on a Windows NT workstation/operating system.

3.1.6. Use-Case Diagrams



Health Survey Form:

The Health survey form is used to enter the patient disease information and it is sent to the RTBP server. In case of SMS/GPRS signal failure it will store the data into Mobile RMS database (“SURVEY”). RMS data will be uploaded into the server once mobile gets GPRS signal. Here the application gets the known Disease, Signs and Symptoms list from RMS storage downloaded in ‘Download List Form’.

Offline Form:

It is used to store the Health Survey form data in the absence of network connectivity to submit record to the RTBP server. Once network is available the application will send the data in the offline storage to the central database.

Download List:

It downloads the known Disease with Symptoms and Signs along with the relationships from the server and stores in the Java RMS in the DIS, SYM, and SIGN databases respectively.

Healthcare worker profile:

Healthcare worker can save their own profiles in java RMS in the “Healthcare Worker” database and upload to the RTBP server. The method allows for more than one health worker profile but will limit the number based on the memory constraints.

Location Management:

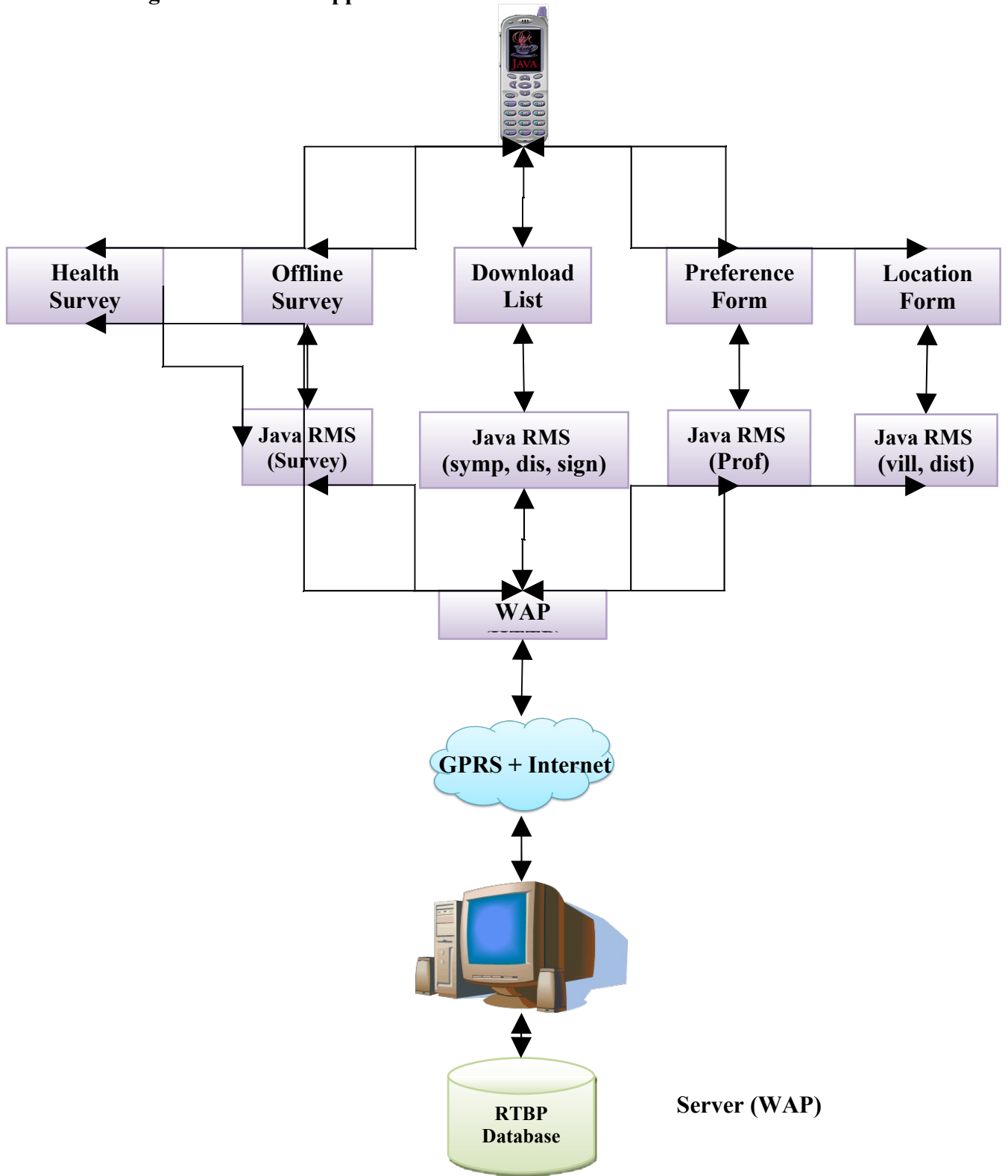
Healthcare Worker has to manage their own Locations in RMS “Loc” database and also upload to the RTBP Server; e.g. Village name (vill) or District name (dist). The location will also contain the parent location it belongs to; i.e. the larger area the location is embedded in such as a village in a district.

3.1.7.Main Scenarios

The program must validate GUI inputs.

1. If the login is incorrect, the program must show alert message to the user about incorrect login.
2. If a new healthcare worker wants to register but the registration is already done, then the program must show alert message to the user.
3. Provide the possible Information/Warning/Error using alert
4. User can easily move from one screen to another screen
5. Enable the mobile dictionary to enter the values
6. Must validate the values like E-Mail ID, Decimal, Real values etc.
7. Users have to know the status information and alerting information.
8. Data should be stored in the local database when SMS/GPRS is not activated.
9. Once SMS/GPRS is connected, the local data must be sent the server from the local database.
10. Application updates through GPRS

Flow Diagram for mobile application



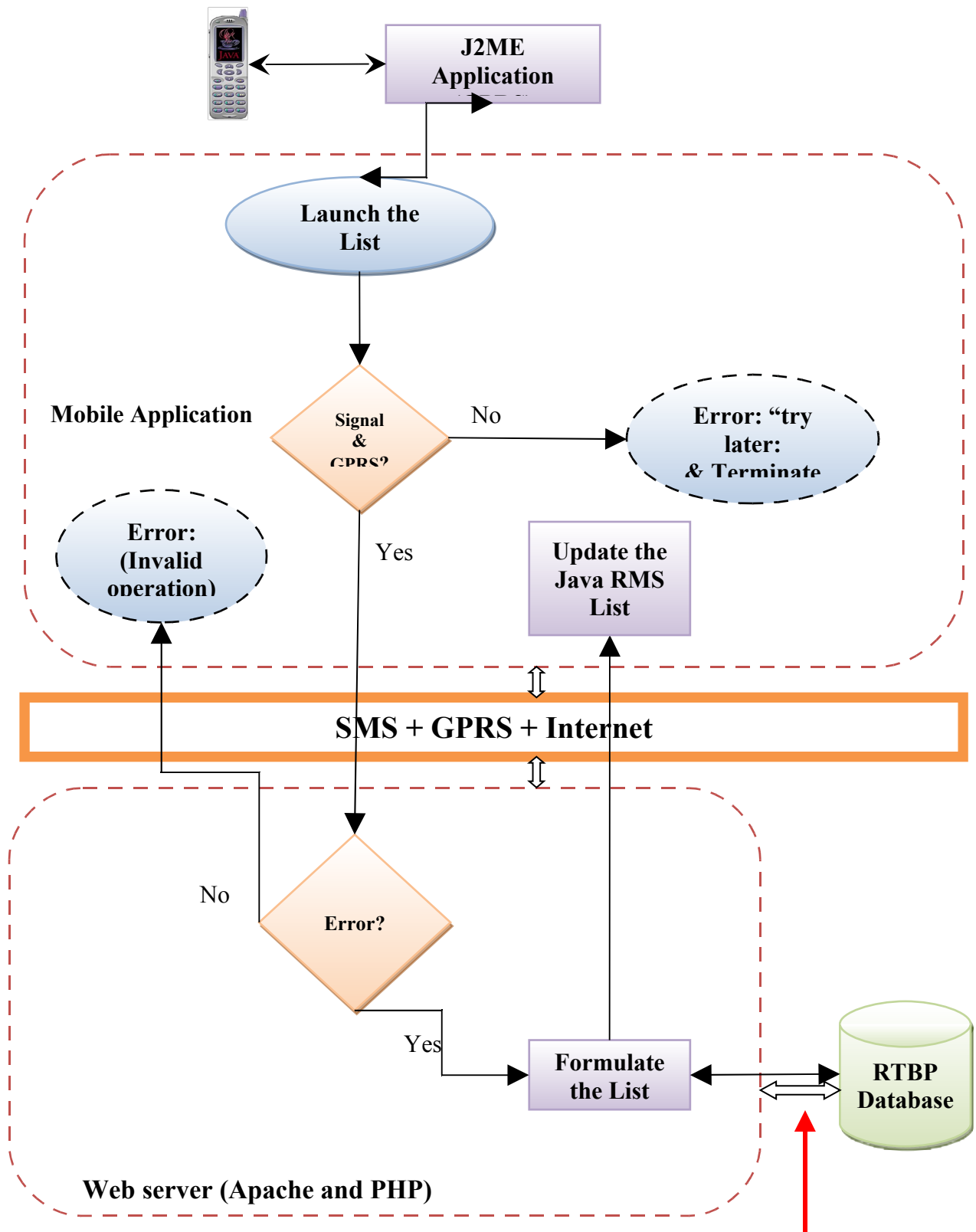
This is the overall flow diagram for mobile application. The Mobile application contains four forms named:

1. Health Survey
2. Offline Survey
3. Download List
4. Profile
5. Location

To initialize the application we have to fill up the profile and location forms. The data of the profile and location forms will be sent to server as well as Java RMS. Once we have done the process the location and user id will be made available to the health survey form from the RMS. Then we can start to fill up the Health survey form. This health survey data will be sent to the server through SMS/GPRS. If no signal then the data will be stored in the RMS. Thereafter, user can view the stored data using the Offline Survey form. Once we got the signal then the user has to send the data from the Offline survey form to RTBP server. The Download list form is used to download the sign, symptoms and disease from the server. The user can use the application without downloading the disease, symptoms, and signs list but is strongly advised to download the list to avoid misspelling of strings and jeopardizing data integrity issues in the database and causing inaccuracy in analysis.

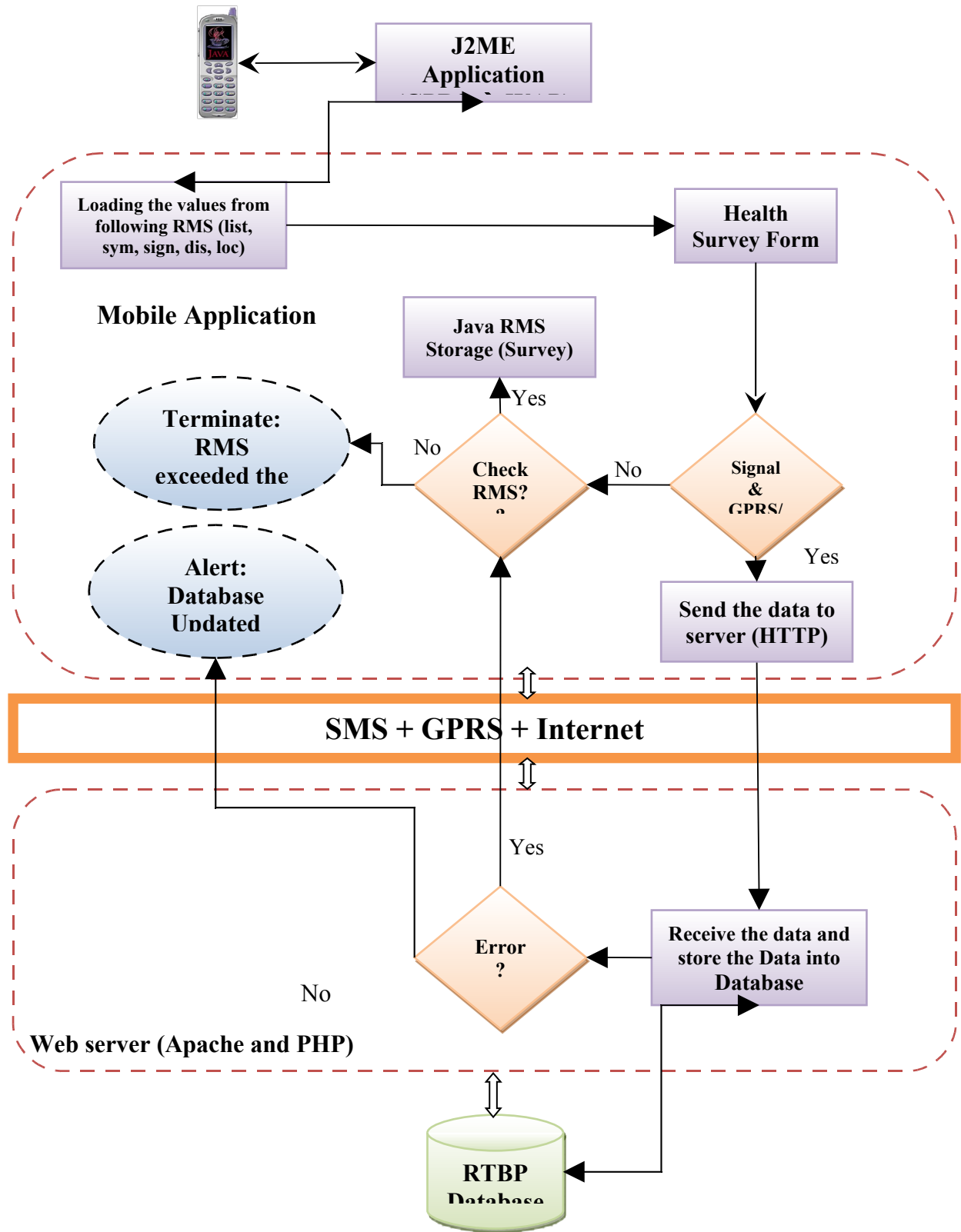
Flow Chart for Loading the Symptoms, signs and disease list from Server (SMS/GPRS)

The following flow chart describes the “Download List” menu, it is used to download the signs, symptoms and disease list from server using SMS/GPRS. When we launch this list, it will check whether the SMS/GPRS is enabled or not. If signal is there, the list will be updated from the server to RMS. If there is no signal, it will terminate.



If there is an error in “formulating the list” at the database then that error should be communicated to the user

Health Survey Form



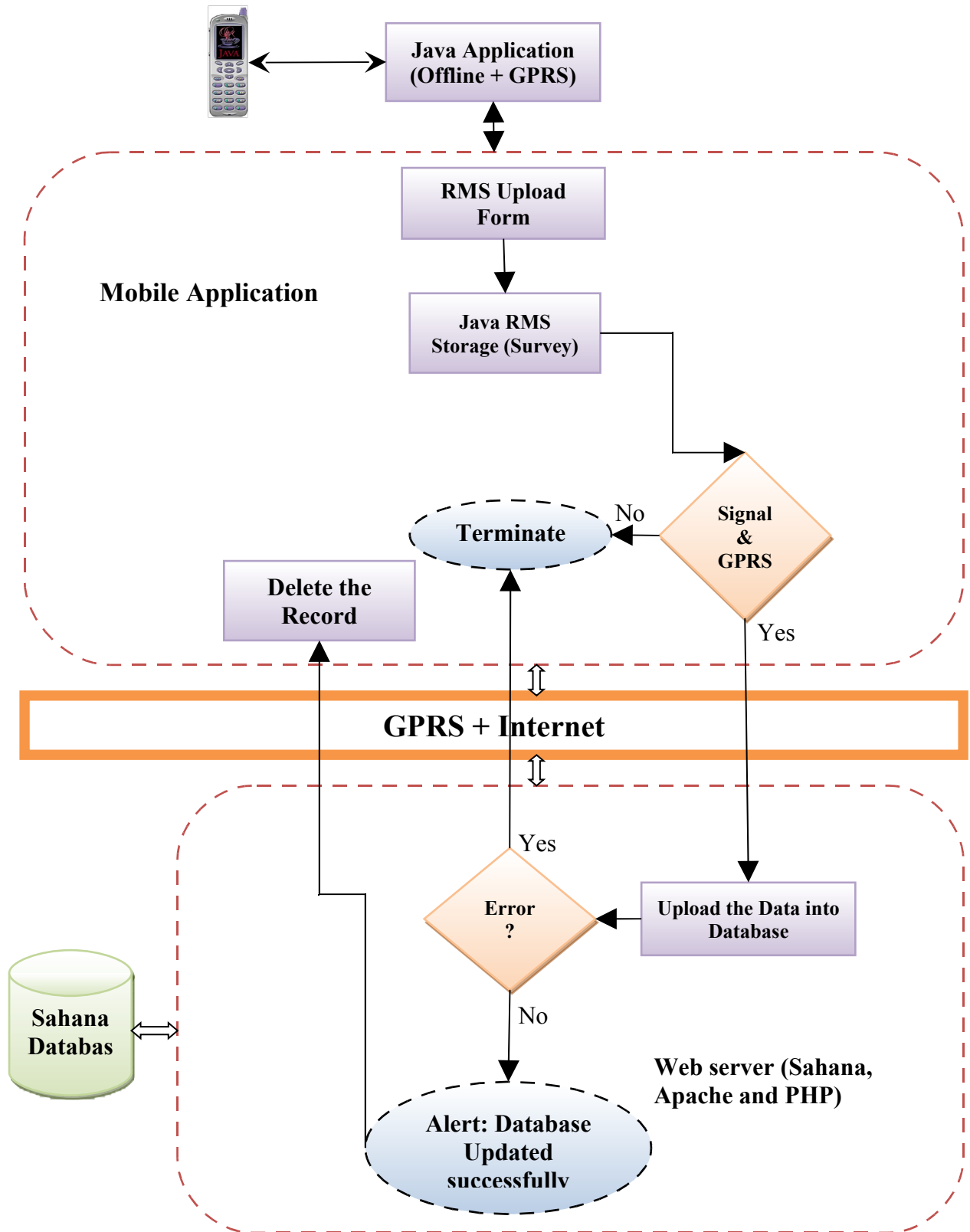
When health worker selected the Health Survey form, it gets the following information from Java RMS named location, profile information, disease, known symptoms and signs. Once the information has been filled by the health worker, he has to submit the data to server and it will check the signal. If signal is there the data will be submitted to the RTBP server and updated message will be displayed in the screen. If there is an error or no signal, the data will be stored in the RMS.

The Healthcare worker has to send the following information to RTBP server

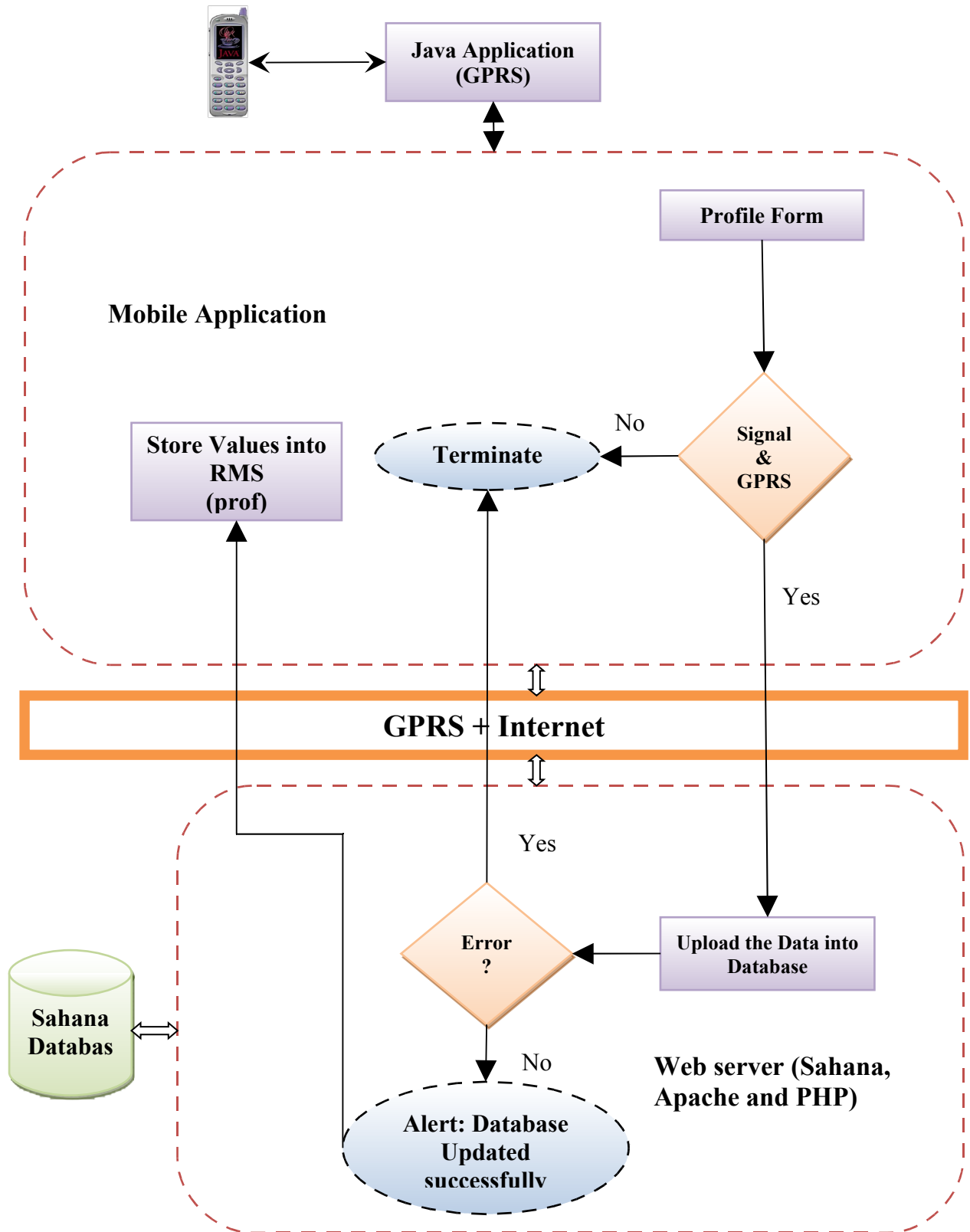
1. Date and time of the visit
2. Location (from Location Form)
3. Healthcare ID (from Profile Form)
4. Patient First name
5. Patient Last Name
6. Sex
7. Age Group
8. Disease
9. Symptoms
10. Signs
11. Status

Offline Upload (from Java RMS ‘SURVEY’)

The following flow chart describe the uploading of the Offline Survey data (Stored by Health Survey Form) to the RTBP server once network is available. The Health worker has to manually select the “Offline Survey” (available in the main screen) menu, whenever they want to upload the offline data. If the “SURVEY” Java RMS is empty it will give information to healthcare worker.



Profile Form



The healthcare worker has to enter their details and sends to the server as well as Java RMS. Whenever the healthcare worker select health survey form the profile information loaded from the Java RMS. If there is no signal or error then the form will be terminated, even it won't store the value into RMS. This form has the option to add new, modify and delete the healthcare workers.

The profile form must have the health worker types (i.e. person types) in the RMS before they can begin registering profiles. The list of health worker types can be downloaded from the RTBP server.

The Healthcare worker has to configure the following information,

1. Healthcare worker's ID
2. First name
3. Last name
4. Type
5. Phone
6. E-mail Id

Location Form

The healthcare worker has to enter their location (e.g. village name), parent location (e.g. Block the village belongs to), and type in location form and sends to the server as well as Java RMS. Whenever the healthcare worker select health survey form the location information loaded from the Java RMS. If there is no signal or error then the process will be terminated, even it won't store the value into RMS. This form has the option to add new location, modify existing location and delete the unwanted location.

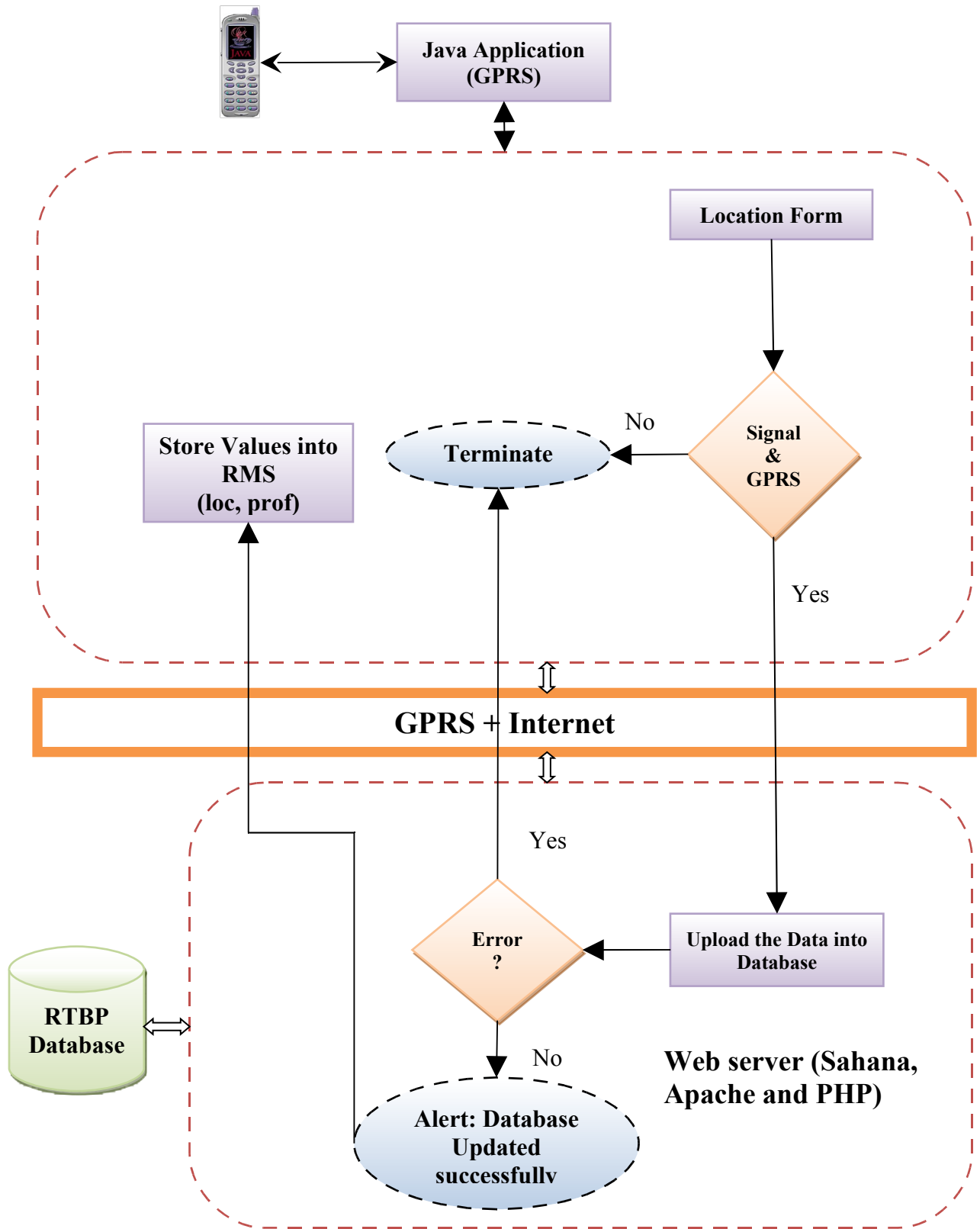
If the location submitted by the user is already in the database (e.g. same location had been submitted and registered by another user), then the database will do nothing but return a confirmation to the mobile application. Users are strongly recommended to submit the correct spelling of location name parent location name to avoid multiple instances of same location residing in the database. The super users should occasionally review the database to ensure

multiple instances are not registered. In the event of multiple instances of same location, the super user should make the corrections in the database and also inform the users to edit the location information to correct the error.

The location form must first download the location types from the database before the user can start registering locations.

The Healthcare worker has to enter the following information,

1. Location
2. Type (Panchayat, District, Taluk, Block, PHI area, MOH div, District, Provincial, Regional, and National and etc.,)



3.1.8.External Interfaces (if any)

Some external interfaces may be required to develop and test the mobile application,

1. USB Cable (PC to mobile communication)
2. Serial Port (PC to mobile communication)
3. External memory card for mobile device

3.1.9.Data Storage (files and databases)

For offline data storage we will be using “Record Management Storage”. Basically we are storing the healthcare workers’ user profiles, healthcare workers’ location management and offline survey information in the RMS.

The following Databases are being used to store the records.

DIS – For storing the disease list

SYM – Known symptoms list for the disease

SIGN – Known signs list for the disease

PROF – Used to store the healthcare worker profile information

The syntax of “PROF” RMS database

id#firstname#lastname#type#phoneno#emailid

LOC – Used to store the healthcare worker locations

The syntax of “LOC” RMS database

id#locations#locationtype

SURVEY – Offline survey health records

3.1.10.Implementation Notes

1. How to configure application such as setting URLs to download and store data because this will depend on the implementation ... perhaps you need to create an alternate RMS or file to store the application configuration information with instructions for super user or system administrator to use for configuring the executable (JAR).
2. Super users or implementers should set up the database and web server first on a desired operating system (windows, linux, debian, etc). Current database is MySQL and web server is Apache.
3. The mobile application interfaces with PHP objects to communicate with the database via the webserver; hence, PHP 4 or 5 should be installed and running on the server
4. A consolidated installation of MySQL, PHP and Apache is made available in the “wampserv” installation package and can be downloaded from - <http://www.wampserver.com/en/download.php>
5. Implementers must first define the location types and health worker types (i.e. person worker types) to make it available for the mobile app to download and store in the RMS.
6. The mobile application JAR file (i.e. executable file) must be made available on the web for the users to download the app via GPRS on the mobile phone
7. A WAP based installation, application initiation, and user guide must also be made available on the same website for users to refer to.

4. References

1. <http://java.sun.com/javame/index.jsp>
2. <http://www.w3schools.com>
3. <http://www.sahana.lk>
4. J2ME Mobile Information Device Profile (MIDP) specifications, version 2.0 (JSR 118), Sun Microsystems, Inc, 2004.
5. Connected, Limited Device Configuration (CLDC) specifications, version 1.1, Sun Microsystems

6. <http://www.javaworld.com/javaworld/jw-12-2002/jw-1220-wireless.html> - Data security in mobile Java applications