

# *Real-Time Biosurveillance Program*

## project partner meeting report



The scope of this report is to share the notes from the 4 consecutive meetings held 03-Aug-08 to 05-Aug-08 at the IIT-M's Rural Technology and Business Incubator. The four independent meetings can be categorized as

- 1) Project objectives
- 2) Introduction to partner expertise
- 3) Mobile applications architecture
- 4) Revised work plan

A list of meeting participants can be found in the [Aug 4<sup>th</sup> partner meeting program](#). Sub groups of the same met on the 3<sup>rd</sup> and 5<sup>th</sup>.

### 1) Project Objectives

- Deploying of a mobile phone application for gathering *symptoms* and *diagnosis* information (m-Health sensor system).
- Train the Gov Community-Healthcare-Workers (VHN in India and PHI in Sri Lanka) on using the mobile app and adopting processes for submitting health-related information. Training material (user manual) will be produced by the technology partners developing the software.
- Evaluation of the usability (HCI aspects), adaptability (social acceptance), and robustness (reliability, effectiveness, and interoperability) of the mobile phone based data acquisition process. The evaluation will primarily focus on operations research.
- Deploy advanced detection software algorithms such as *spatio-temporal scanning*, *Bayesian modeling*, and *multivariate time series analysis* for statistical data mining for State/Regional Epidemiology Units to detect disease outbreaks.
- Train the State/regional Epidemiology Units with the tools and processes to analyze the gathered health-related data to detect disease outbreaks in near real-time.
- Evaluate the ability of the detection system to assist the National/State/regional epidemiology units with their task of discovering outbreaks a head of time. The RTBP will be weighed against the existing surveillance and notification paper based system. The data will be independently analyzed by one or more masters students to check if there are any outliers that may or may not have been detected by the statistical data mining software. Further carry out the analysis in a timely manner, reliably predicting disease outbreaks with minimal ambiguity, and interpreting the analyzed information with zero complexity.

- Deploy a disease outbreak notification software tool for State/Regional Epidemiology Units to use for notifying divisional and community Healthcare-Workers of a possible disease outbreak as well as monitor the situations with feedback reports on the response actions
- Train the State/Regional Epidemiology Units on the software tool and processes in notifying possible disease outbreak as well as instructions on protocols
- Evaluate the notification system for its usability, reliability, and effectiveness in managing communications with Healthcare workers during and emerging disease outbreak emergency situation
- Deploy a interactive voice recognition software for providing a help desk and alerting platform for the healthcare workers, government and NGO.
- Disseminate the outcome of the research for policy makers, practitioners, and researchers to study the lessons learned

## 2) Introduction to partner expertise

This was a half day formal meeting with the participation of all partners. The goal of the meeting was to communicate the project objectives to the partners and give them opportunity to understand them well. The meeting also gave the partners the opportunity discuss their roles and responsibilities. The paragraphs bellow will summarize the presentations from each of the speakers.



***Mobile phone for public health interventions*** (Gordon Gow, U of Alberta, Canada): The RTBP which falls under an m-Health project is a unique project. The current state of the art GSM/CDMA handsets are always on and networked personal computers in our pockets; making it an ideal end user terminal device for surveillance and notification. Kenya is running a similar project through the Kenyan government's center for disease control; where mobile phones are used as a wide area surveillance tool to gather health information for intervention. There are other options of using image based technology such as QR-Codes and MMS that can be tested in future pilots of the RTBP.

**CMU Auton Lab Introduction** (Artur Dubrawski, CMU Auton Lab, USA): The software produced are fast and scalable statistical machine learning algorithms. In fast propagating diseases, shaving off a few hours in detecting can save thousands of lives. Simulations on cases in Canada and Israel proved the software to detect the outbreak 2 - 3 days faster than a Clinician detecting an outbreak. In detecting disease outbreaks it is possible to monitor pharmacy OTC sales, school attendance, ER chief complaints, consumer complaints, etc. It was suggested that T-Cube, Tipmon, Multistream Temporal Monitor, WSARE, and Fast Spatial Scan as possible solutions that can be used in the RTBP. The software is available for free download and use. The recent success stories are in food safety, safety of agriculture, and drug discovery.

**Disease surveillance program in Sri Lanka** (Samith Ginige, Epidemiology Unit, Sri Lanka): Epidemiology Unit is a vertical that comes under the director general of health. The Epidemiology Unit has Regional Epidemiologists distributed quasi-uniformly in the Island based on population densities. The 290 Medical Officer of Health report to the Regional Epidemiologist and the Public Health Inspector reports to the Medical Officer of Health. Sri Lanka has developed a formal way of diagnosing and notifying diseases. All epidemiological electronic communications, including the “weekly epidemiological report”, are hosted at <http://www.epid.gov.lk/> . The 70% of the current weekly epidemiological reports are received visa post, on an average, 10 days. Gov healthcare workers would be the ideal to gather health information since 95% of the inward patients are treated by government hospitals.

**Madurai Narayanan Center for Exceptionally Challenged Kids** (Krishnaswami, MNC, India): Child mental diseases are caused by malnutrition during the pregnancy. Cerebral palsy and Cleft Palate are two such diseases that can be prevented. The RTBP should look at both physical and mental disease surveillance and notification. As a benchmark, the detection system must reduce at least 25% of the cases.

**Sarvodaya Primary Healthcare Facilities** (Ravindra Kandage, Sarvodaya, Sri Lanka): The largest Sri Lanka based NGO is developed on the Buddhist Gandhian philosophy has 420 Suwadana Centers (primary healthcare facilities). These Suwadana Centers will be the organized community based healthcare organizations

**Sahana Healthcare and Messaging Module** (Roshan Hewapathirana, LSF, Sri Lanka): The system design must take in to consideration not to overload the healthcare workers with extra work. The Sahana Healthcare System is first being tested for Autism. The Sahana Messaging Module can be used to alert the healthcare workers visa SMS and Email through a one-to-many store and forward method.

**Mobile data entry** (Timothy Gonsalves, TeNet, India): Given that Symbian dominates 70% of the market it is best to go with a J2ME based application that can run on the java stack embedded in the mobile phone software stack. The mobile application can be designed to have to look and feel of a PDA. FRED mobile software applications development tool produced software can be ported to run on the Symbian, Linux, and Android platforms as well produce JSP programming language code to deploy the same mobile application over a Internet browser. Application can be developed using the Javarosa standards.

### 3) Mobile applications architecture

#### *Customer attributes*

Three different transports will be tested: voice, sms, and gprs. The sms and gprs will be a text based system for gathering health data; while the voice will be an interactive voice recognition system that will be tested as a help desk function for domain specific information retrieval. The text based system is the primary objective of the RTBP. However, IITM's RTBI will contribute in-kind a voice recognition system.

#### *Mobile application constraints*

- Must complete the data entry and submission state transitions in less than 1 minutes.
- Application text based component must work on both GPRS and SMS
- No patient identification information will be gathered; i.e. eliminate confidentiality issues

#### *Text based application*

Community-Healthcare-Workers will be mobilized with a java enabled mobile phones installed with a J2ME applet. The application will be a modular design with a built in expert system to navigate the healthcare user through the reporting process under one minute. When the symptoms are entered the application will act as an expert system to suggest the diagnosis and visa versa when the diagnosis is given the mobile-app would suggest the symptoms. The symptoms have precedence over the diagnosis. Even though the diagnosis information can be empty the symptoms cannot be empty. The symptom and diagnosis information will be received through the Community-Healthcare-Workers.

The current system already has a procedure to identify and follow up patient records. Information source can be mapped through the phone number (GSM sim). Therefore, patient identification information is unimportant. Multiple visits will be treated such that the record will be submitted as a "new" or "revisit" record. The information transmitted will be Etiological information. Information will not be filtered at low levels; rather be made available for filtering at the back-end.

The mobile-app will push data to a central database through SMS and GPRS transports, which will be developed by RTBI. Alerts will be pulled to the mobile phone through Sahana SMS Messaging Module through SMS and Email.

Available options for developing the software system --

1. *Xforms* is a standard that is being used to develop both mobile and browser applications
2. FRED is a mobile application development tool from AccelTree (<http://www.acceltree.com/>) that produces J2ME front end applets and a MySQL back end database. The initial beta release of the mobile application and database will be developed using FRED
3. Javarosa open source application code will be scrutinized by the technology-team.
4. Pentaho reporting application will be scrutinized as a tool to distribute downstream reports.
5. Sahana databased will be looked in to for the possibility of being used as the back end database

### *Voice based application*

Uniphore (<http://www.uniphore.com/>) application will be for healthcare-workers and community-healthcare-workers to use for receiving instructions and for the PHI/VHN to send voice messages to selected groups healthcare Gov and NGO healthcare-worker with alerts.

## **4) Revised work-plan**

No major changes were made to work plan v0.2. The updated version with a few spelling and redundant sentence errors were fixed. For latest copy refer to work plan v0.3