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DOCUMENTATION OF RAPIDSMS APPLICATIONIN RWANDA

UWANTWALI ZIGAMA Didier

PIVOT

25-M

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I. OVERVIEW

This documentation does not provide the guide to install RAPIDSMS-RWANDA application, neither the running environment configuration on any platform. However, it does provide the brief understanding on the under laying technologies used to implement the system and the uses of the system, of course the data and the output from the system.

Actually the system has been deployed on the production environment, but we still reviewing and enhancing the system to meet all of the requirements of the system to support maternal health and child health in RWANDA.

II. EXECUTIVE SUMMARY

To reduce the rate of maternal morality in Rwanda, the Government of Rwanda has recognized that community health workers are necessary in order to improve access to health in rural communities. Each of Rwanda's 15 000 villages has a community health worker devoted to maternal and child health issues.

The Ministry of Health, in cooperation with UNICEF contracted Pivot Access to implement an SMS based system to provide a real time community based surveillance and alert system for maternal and child health.

The system was implemented based on the following high level objectives:

- to send emergency alerts to a hierarchy of health professionals
- to give tailored feedback to community health workers to help them make more informed decisions
- provide a general surveillance mechanism for better health policy.

Rapidsms, a free and open-source framework for dynamic data collection, logistics coordination and communication, leveraging basic short message service (SMS) mobile phone technology was chosen as the technology of choice for the implementation of the project.

The RapidSMS application is running on Cherokee Application Server, and the database is stored on MySQL Server. The SMS from and onto the system application are handled by Kannel SMS Gateway.

III.   SYSTEM FUNCTIONALITIES

The Rwanda RapidSMS system was designed to track the following key events in maternal and child Health:
- pregnancy reports
- risk report
- birth report
- child health report
- death report

The SMS reports registering pregnancies, antenatal visits and births should also include various observations, or detected risk factors, such as malaria, fever and vomiting.
Some of these observations create specific **events**, which then trigger **alerts**, and help in **reminding** CHWs, mothers and supervisors to make different informed decisions while others prompt time sensitive follow-up.

See figure below for the reports format and the observation codes.

a) **Reports message structure or format:**

b) **Observation codes**:

RapidSMS² — **Republic of Rwanda Ministry of Health**

Vaccination Codes
V1 - BCG, P0
V2 - P1, Penta1, PCV1
V3 - P2, Penta2, PCV2
V4 - P3, Penta3, PCV3
V5 - Measles

Birth Action Codes
NA - never received antenatal care
TW - twins
TR - triplets
BO - male child
GI - female child
TE - mother at term
LA - mother in labor

Risk / Health Action Codes
NP - no problem
SC - serious condition, but unknown
CI - cord infection
DI - diarrhea
MA - malaria
FE - fever
HY - hypothermia
RB - rapid breathing
PN - pneumonia
HE - hemorrhaging / bleeding
VO - vomiting
CO - convulsion
SA - severe anemia

CH - coughing
UN - unconscious
OE - oedema
FP - flaccid paralysis
NS - neck stiffness
CM - congenital malformation
JA - jaundice
AF - abnormal fontanel
PC - premature contraction
SL - stroke labor
DS - chronic disease
PS - labor on previous cesarian section

Death Action Codes
MD - maternal death
MC - miscarriage / still born
CD - child death

Location Codes
CL - at clinic
HP - at hospital
HO - at home
OR - on route

Pivot Access developed the system with a set of functionalities for RapidSMS required to support maternal and child health monitoring.

The functionalities of the initial system included:

- Ability for CHWs to register themselves by SMS and link themselves to the system through their phone number;
- Ability for health clinic supervisors to register themselves via SMS and link themselves to the system through their phone number
- Ability to report, via SMS, pregnancies, births and deaths as well other important events such as child health reports and risk reports.
- Automated alert and notification system aimed at reducing communication gaps that affect proper treatment of children and mothers.
- A basic web interface for the health teams and system administrators to view aggregate monitoring data and to perform system management task such as user, roles and alerts management.

IV. INPUT AND OUTPUT OF THE SYSTEM

After the completion of the project a pilot launch and training was conducted in several villages of Musanze district to get feedback on the effectiveness and challenges of the system.

The following are the figures showing the sample of input and output of the system and the representation of data, and where they are coming from:

1. CHWs COMPOSING REPORTS ON MOBILE TELEPHONES

2. INPUT MESSAGE SENT FROM CHW TO THE SYSTEM

24-May-2011 20:05:40   +250785320059   kannel   CHI 1198470110819042 01 11.04.2011 V2 NP HO 4KG   <<<
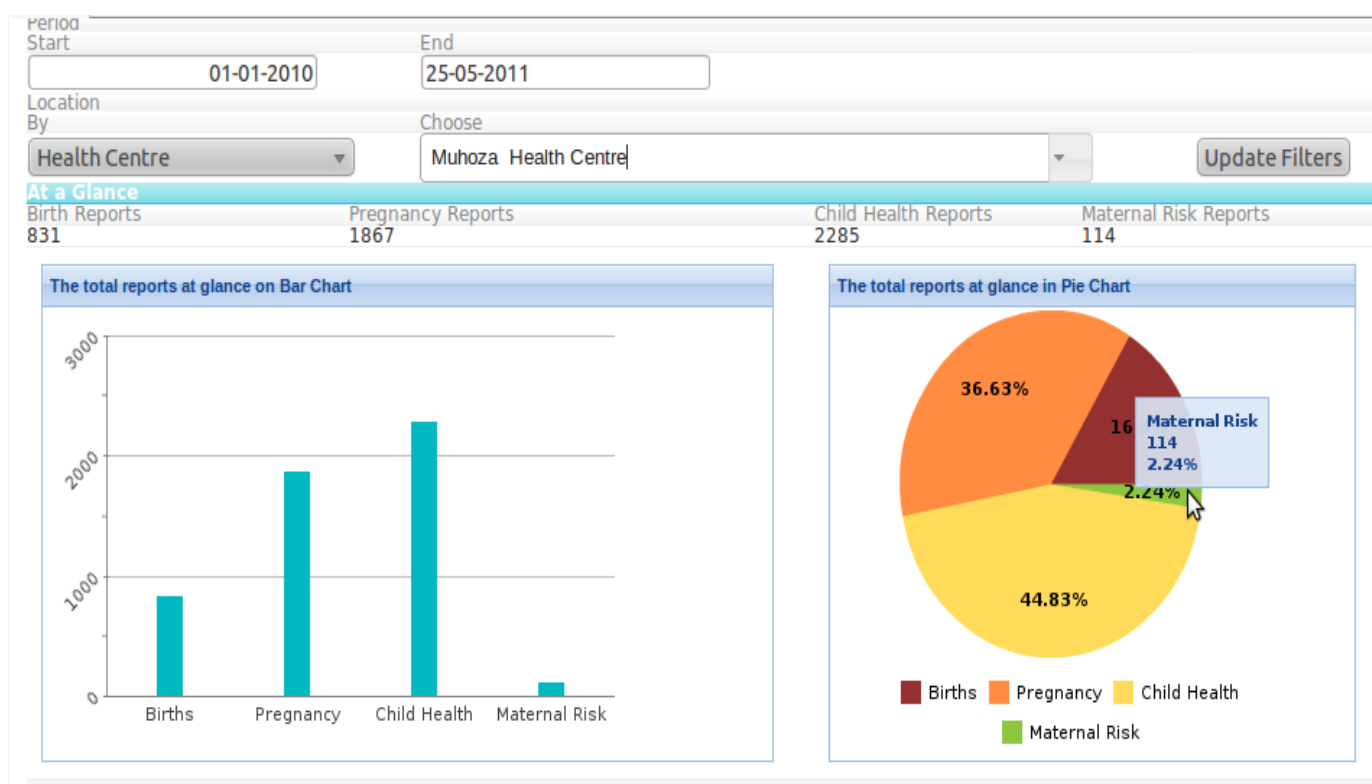
3. RESPONSE SENT BACK TO BOTH CHW and SUPERVISORS(HEALTH CENTER, DISTRICT HOSPITAL,... LEVEL)

Date	Phone	Channel	Message	
24-May-2011 20:05:41	+250785320059	kannel	Murakoze, ubutumwa bw'ubuzima bw'umwana bwatugezeho	>>>
24-May-2011 20:05:41	+250785320017	kannel	+250785320059: Child Health Report: Patient=1198470110819042, Location=Busogo (RW N GO), Date=11.04.2011, Vaccine: P1, Penta1, PCV1, No Prob	>>>
24-May-2011 20:05:41	+250785371340	kannel	+250785320059: Child Health Report: Patient=1198470110819042, Location=Busogo (RW N GO), Date=11.04.2011, Vaccine: P1, Penta1, PCV1, No Prob	>>>
24-May-2011 20:05:41	+250788300403	kannel	+250785320059: Child Health Report: Patient=1198470110819042, Location=Busogo (RW N GO), Date=11.04.2011, Vaccine: P1, Penta1, PCV1, No Prob	>>>
24-May-2011 20:05:41	+250782943210	kannel	+250785320059: Child Health Report: Patient=1198470110819042, Location=Busogo (RW N GO), Date=11.04.2011, Vaccine: P1, Penta1, PCV1, No Prob	>>>

4. OUTPUT FROM THE SYSTEM TO THE WEB FRONT END

Id	Date	Location	Type	Reporter	Patient	Message
42200	24.05.2011	Busogo	Child Health	1198070095651026	1198470110819042	Date=11.04.2011, Vaccine: P1, Penta1, PCV, No Problem, At home, Child weight=4.00, Child Number=1.00

5. AGGRETION OF REPORTS RESPECTIVELY IN TIME AND LOCATION

V. SYSTEM PRODUCTION ENVIRONMENT AND DATA FLOW

The system adheres to RapidSMS coding standards, and allows data collection, logistics coordination and communication allowing any mobile phone to interact with the web via SMS text messages. The system is a SMS text-based that manages data collection and complex workflows.

To ensure that the system is practical and simple enough to meet real world needs, the system was deployed and set up in environment with both hardware and software that are flexible and scalable enough to handle vast amounts of data and users, and able later on demand to support the exchange of information.
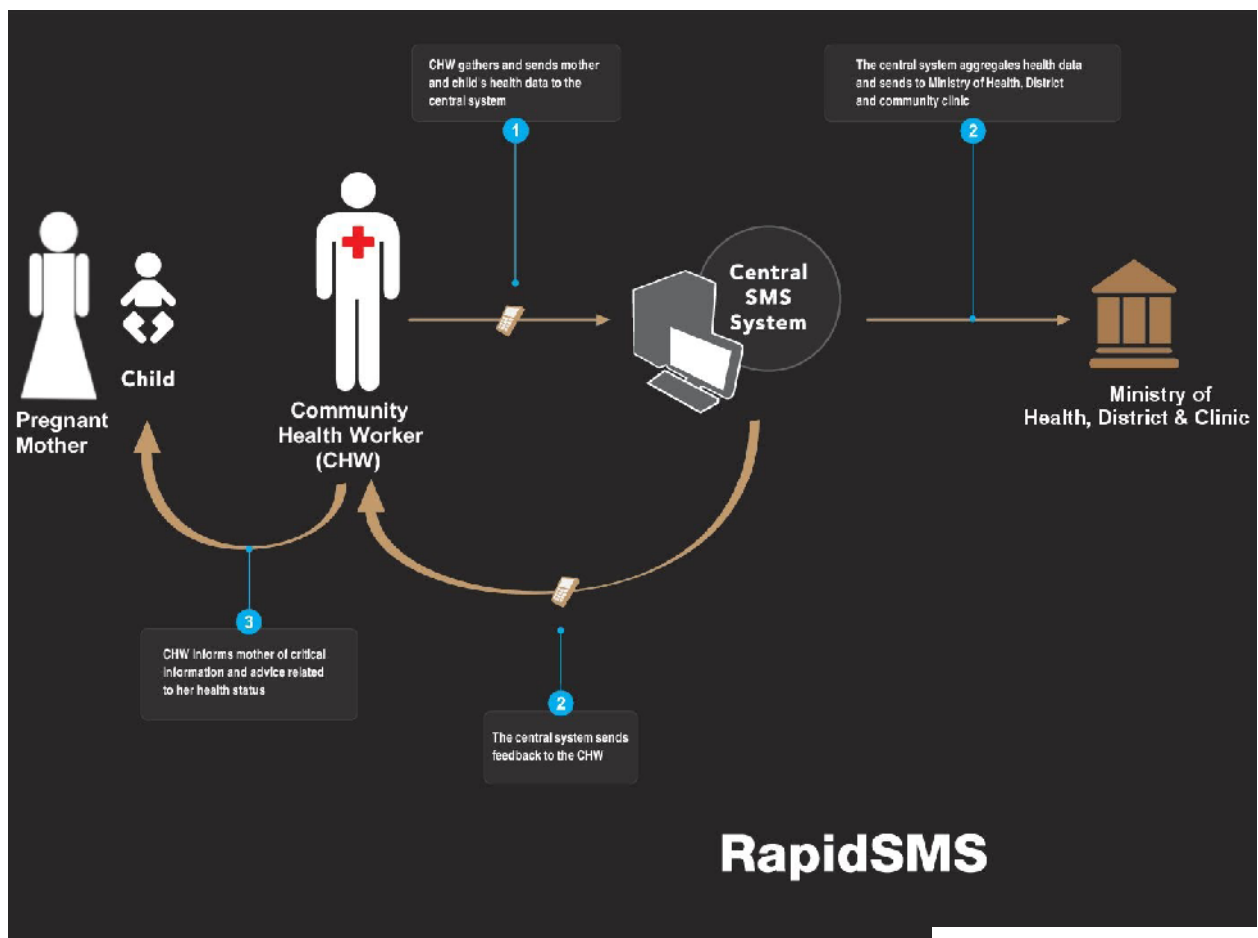
The following tools have been used to support and provide the flexibility and scalability of the system environment:

- **GNU/LINUX UBUNTU operating system (Version 10.4)**
- **Cherokee Application Server (Version 1.0.16):** Cherokee is a high-performance web server. It is very fast, flexible and easy to configure. In fact, it is the fastest web server there is. It offers support for the widespread technologies nowadays: FastCGI, SCGI, PHP, CGI, SSI, TLS and SSL encrypted connections, Virtual I

the fly encoding, Load Balancing, Apache compatible log files, Data Base Balancer, downtime-free updates and upgrades, Reverse HTTP Proxy, and much more.

- **MySQL Database Server(Version 5.0.75):** MySQL is a relational database management system, with high performance and which supports many features for managing data, among them are Client/Server architecture, SQL compatibility, SubSELECTs, Views, Stored procedures, Triggers, Unicode, User interface, Full text search, Replication, Transactions, Foreign key constraints, GIS functions, Programming languages, ODBC, Platform Independence, and Speed.
- **Kannel SMS Gateway (Version 1.4.3):** Kannel is a compact and very powerful open source WAP and SMS gateway, used widely across the globe both for serving trillions of short messages (SMS), WAP Push service indications and mobile internet connectivity.
- **Python version 2.6**
- **Django version 1.0.2**
- **Rapidsms version 1.0.2**

The following figure shows and describes the system data flow.

RESOURCES

1. **Rapidsms Website:** http://www.rapidsms.org
2. **Rapidsms in Rwanda Website: http://www.rapidsms.moh.go.rw**
3. **Kannel Website: http://www.kannel.org/**
4. **MySQL website: http://dev.mysql.com/**
5. **Cherokee Website: http://www.cherokee-project.com/**