The Sahana Software Foundation response to the 2010 Haiti Earthquake: A New Standard for Free and Open Source Disaster Data Management Systems

Mark Prutsalis
Sahana Software Foundation
mark@SahanaFoundation.org

David Bitner
Sahana Software Foundation
bitner@SahanaFoundation.org

Praneeth Bodduluri
Sahana Software Foundation
lifeeth@SahanaFoundation.org

Francis Boon
Sahana Software Foundation
francisboon@gmail.org

Chamindra de Silva
Sahana Software Foundation
chamindra@SahanaFoundation.org

Dominic König
Sahana Software Foundation
dominic@nursix.org

Gavin Treadgold
Sahana Software Foundation
gavin@SahanaFoundation.org

INTRODUCTION: THE EARTHQUAKE

On 12 January 2010 at 21:53 UTC / 4:53 PM local time, a 7.0 magnitude earthquake struck the poverty-stricken Caribbean nation of Haiti, just south of the densely populated capital city of Port-au-Prince. The impact of the earthquake was devastating, with large numbers of multi-storied concrete structures in the capital and surrounding municipalities collapsing, killing tens of thousands instantly, while injuring and trapping thousands of others beneath the rubble, and leaving millions homeless.

The event occurred just weeks after the fifth anniversary of the Indian Ocean tsunami, the last major natural disaster of this scale, and the last time the international community has been called on to respond to a disaster of this magnitude with a lifesaving search and rescue and emergency relief effort, under the coordination of the United Nations and foreign governments such as the US, who provided assistance on a massive scale utilizing its military assets as part of an international Humanitarian Assistance/Disaster Response (HA/DR) effort.

It was therefore appropriate that the Sahana Software Foundation and its free and open source software (FOSS) project, which was created in Sri Lanka by the open source community to assist that country recover from the aftermath of the tsunami, played such a central role in helping to coordinate the relief efforts for Haiti.

SAHANA SOFTWARE FOUNDATION RESPONDS

The Sahana Software Foundation and the Sahana community immediately responded to the earthquake in Haiti, working around the clock to set up a hosted instance of Sahana (the first deployment of Sahana's python-language version – SahanaPy) on a public website that served to fill gaps in the information management requirements of the

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relief operation.

The Sahana Haiti 2010 Earthquake Disaster Response Portal - a live and active website hosted at http://haiti.sahanafoundation.org provided the following functionality according to the cyclical and evolving needs of the responders:

Phase 1: Organization Registry (OR): In the first 48 hours after the earthquake, what responders wanted to know was who else was responding, what organizations already had staff in Haiti that could assist, where were they located, and what assets and resources they had available to them. Sahana's Organization Registry served to track organizations and offices working on the ground in Haiti. The OR provided a searchable database of organizations responding to the disaster, the sector where they are providing services, their office locations, activities and their contact details. It became one of the primary repositories of organization, office and contact information for the relief operation during the first couple of weeks of the response. Organizations were encouraged to self-register and report their office locations or to simply send the Sahana team by e-mail their office or lists of offices and volunteers were organized to assist with data entry and to aggregate lists from many sources. Data from pre-disaster lists of organizations working in Haiti available from UN OCHA, as well as active contact lists used by UNDAC, OCHA, InterAction and other sources with official and accurate points of contact was entered into Sahana

Phase 2: Request Management System (RMS): The next priority for responders was to know where relief and life-saving efforts were needed. To address this, Sahana provided a simple Request Management System (RMS) where the requests for assistance (such as "send water") were made visible to relief organizations working on the ground. Sahana added the capability for organizations to claim requests for fulfillment and later mark them as completed. The RMS also contained a simple ticketing, tracking and reporting system.

The Sahana Software Foundation worked with the US State Department, Ushahidi, EIS, InSTEDD and others on a project to process SMS messages with requests for assistance and information sent from Haitian citizens. SMS text messages sent to short code 4636 in Haiti were translated from Kreyol by Haitian diaspora volunteers and put into a structured data format identifying the sender's name, location (to the extent possible), and category of the message. The message were published by a GeoRSS feed from Ushahidi that was then captured by Sahana. Sahana also developed the capability to push updates back to Ushahidi so others could see which requests had been responded to.

The RMS also captured structured messages posted to twitter using a hashtag system developed by the Tweak the Tweet project from the University of Colorado at Boulder's Project Epic. These messages were also available for review, response and fulfillment within Sahana, although a human filter to separate actionable messages from clutter was needed to make this effective.

The RMS was later adapted for use in helping to manage requests for assistance, resources, staff, medical supplies for the Hospital Management System and for the Food Request Portal.

Phase 3: Hospital Management System (HMS) During the second week of the relief operation, there were requests coming from all directions seeking to identify the location and operating status of hospitals and medical facilities within Haiti. Sahana organized a volunteer effort to geo-locate approximately 100 hospitals with names by no known coordinates over a 24 hours period. The results of this effort added over 160 hospitals to the Sahana registry that had been set up to manage medical and health facility capacity and needs assessment. This registry was designed to be compliant with the OASIS EDXL-HAVE interoperability standard that provides a schema for tracking hospital capacity and bed availability data during emergencies. A KML feed of Sahana's hospital location data remained the most accurate and complete source of operating hospital facilities throughout the first two months of the relief operation and was accessed by thousands of users world-wide.

Phase 4: Food Cluster Food Request Portal (FRP): Once organizations, immediately lifesaving needs, and health and medical needs for the injured were addressed, the next challenge faced by the relief operation was ongoing support and care for the victims. To address the needs of their food distribution planning, the World Food Programme (WFP) asked the Sahana Software Foundation to adapt its Request Management System and Organization Registry for coordinating the food aid distribution plans for the Food Cluster in Haiti. About one month after the earthquake, the FRP system was stood up for such use. It allows WFP's Implementing Partners (relief agencies) to identify their location and provide details as the their planned program activities, including the number of beneficiaries they are serving (broken down by age and gender). This allows WFP to determine the appropriate types and quantity of food aid needed. The Implementing Partner agency can then make requests for delivery or arrange to pick up food aid at a WFP warehouse. WFP receives those requests through the FRP and confirms the request, then schedules a delivery or pickup and communicates back to the Implementing Partner

through an SMS message generated by Sahana. This simple request-based planning tool may end up being used by the World Food Programme and the Food Cluster for its global relief operations.

In addition to these core missions, the Sahana portal provided the following functionality:

Persons Registry (PR): The Persons Registry serves as the main repository of all person-specific contact information for Sahana, including registered Sahana users and organization staff. It is utilized and referenced by virtually all other Sahana registries as the place where name, address, and contact information is stored for person entities.

Disaster Victim Identification (DVI) Registry: The DVI was designed for the management the handling and tracking and tracing of the deceased, dead bodies and their identification. There is currently no other known application for this and Sahana's DVI has been built to Interpol forensic standards.

Shelter Registry (SR): A Shelter Registry was populated with data pulled from other sources through open standards for data exchange identifying the locations of temporary encampments spontaneously and systematically set up to provide temporary shelter for the thousands rendered homeless from the earthquake. By pulling the data into a registry rather than simply displaying it as a data layer on our mapping client, it enables Sahana to manage transactional data as part of our other efforts (i.e. it allows someone to record the population of the encampment, its needs for water, food, and other supplies, and to manage requests to send supplies there, which you can not do with a single plotted point on a map. (At the time of submission, this module has been configured and is ready for use in Haiti, but in the absence of a specific end-user request, is has not yet been enabled).

Situation Mapping - Sahana's site is able to map all of the geo-referenced data within Sahana – the Organization and Office data, the location of hospitals and medical facilities in the Hospital Management System, locations of food distribution sites including their request status, other geo-referenced requests for information or requests for assistance in the Request Management System, and other important locations such as temporary encampments and relief centers.

Sahana has worked with members of the OSGeo community to obtain a fast tiled set of the current imagery being made available by Digital Globe. Sahana is also leveraging the constantly updated set of Open Street Map tiles. Other data sources that are being utilized within the system include informational feeds from Ushahidi, various point layers and updated road overlays from Open Street Maps, location names, USGS earthquakes, and locations from GeoNames. Sahana continued to build out these capabilities as relevant layers were made available. Throughout the operation

Translation: Sahana's translation project was set up to provide Haitian Kreyol and French translations of the Sahana instance stood up for the relief effort. For the food portal, the World Food Programme itself coordinated translations into French, Kreyol and Spanish.

Finally, there were some independent of the Sahana Software Foundation deployments of Sahana technologies to support the Haiti earthquake response. The most prominent was done by the National Library of Medicine:

Haiti Earthquake People Locator (HEPL): The National Library of Medicine (NLM), the world's largest medical library and an arm of the National Institutes of Health (NIH), released a version of their Sahana-based "Lost Person Finder" system for the Haitian disaster, called HEPL for "Haiti Earthquake Person Locator". The site, located at http://hepl.nlm.nih.gov/inw/ provides an interactive Web site that provides information about people who have been found in Haiti or who are still missing. The NLM also developed a specialized "Found in Haiti" iPhone application to geolocate found persons and display it on the site. The HEPL system shares information with other person finder systems using the PFIF standard, including Google's Person Finder, to ensure that all searches operate across the largest possible set of matches. It basically provides a public viewer for Google records (using an interactive Notification Wall), with filters for metadata beyond name, and a supplementary iPhone- or email-based input method (with forwarding to Google so the master registry is maintained).

STANDARDS

Sahana's use and promotion of Open Standards for Data Exchange played a large role in Sahana's success in responding to the Haitian earthquake, and had a positive impact on many other efforts and projects as well. Sahana's REST Controller allows Sahana to publish its data in the following standard, common, and well-known published

formats: kml, json, georss, gpx, xml, xls, csv, pfif (for missing persons/disaster victims data), and EDXL-HAVE (for hospital management system data).

PFIF: For Missing Persons Registry / Disaster Victim Identification (DVI) Registry, Sahana worked closely with Google, Yahoo and others to ensure that an agreed common standard for the exchange of Missings Persons data was implemented using the PFIF (Person Finder Interchange Format) standard and the Google site at http://haiticrisis.appspot.com/ became the main aggregator for collecting all missing and found persons reports. Sahana embedded Google's widget on its portal. Agreement on such a standard allowed the National Library of Medicine to effectively launch their HEPL system. By importing missing and found persons data into Sahana, we can allow others to manage that data better – including through the Disaster Victim Identification registry. In addition, the Sahana Missing Persons registry has additional physical description information fields (not being utilized by the Google person finder or PFIF). And because Sahana and Google are utilizing the same published standard for data exchange, any updated missing persons status information that Sahana can provide can be pushed back to the main Google repository or whatever other repository may be out there that can accept and process PFIF.

EDXL-HAVE: The real success story in terms of open standards concerned the adoption mission-wide of the EDXL-HAVE standard by the Pan American Health Organization (PAHO – the World Health Organization branch for the Americas), USG and responding agencies and technology providers such as Sahana, Google and others involved in collecting hospital data because of the example set and advocacy of the Sahana Software Foundation.

EDXL-HAVE (Emergency Data Exchange Language – Hospital Availability Exchange) is an XML-based OASIS standard that was designed for exactly the type of requirements needed for Haiti – including the ability to report on a hospital or health facilities operating status, bed availability and resource needs. ("OASIS is a not-for-profit consortium that drives the development, convergence and adoption of open standards for the global information society" http://www.oasis-open.org).

Within two weeks of the earthquake, the Sahana portal included a hospital management system that provided an EDXL-HAVE feed. Foundation members later worked to extend the use of EDXL-HAVE to other systems working to collect similar data for Haiti, thus ensuring interoperability and the ability to seamlessly exchange data between these systems. Today, an EDXL-HAVE based architecture is being adopted by the Health Cluster for Haiti coordinated by the PAHO and eventually will be handed over to the Haitian Ministry of Health.

CONCLUSION

The technology community's response to the Haitian earthquake was an unprecedented collaborative and cooperative effort on the part of different organizations to come together and to help each other and to not replicate efforts. The Sahana community worked closely and constantly with group such as InSTEDD, Ushahidi, haitianquake.com, Google, the Crisis Commons/Crisis Camp community, and many others, Sahana would not have been able to accomplish all that it did without these partners and they deserve due credit for all achieved.

As an example of this, in late July, representatives from Sahana, Ushahidi, FortiusOne, the Open Solutions Group, Instedd, Mindtel, Crisis Commons and Star-Tides deployed to Miami to demonstrate to US Southern Command, who was providing many of the search and rescue and logistical assets in Haiti, how we could collaboratively help them solve their situational awareness and information management problems. This solution ultimately was based on Sahana's Hospital Management System data structure and EDXl-HAVE and eventually spawned a collaborative project called Kapab (Kreyol for "capable) designed to support the medical supply management needs of PAHO and the Health Sector.

This has been a new model for Sahana deployments - rather than waiting for a specific customer to come forward to take ownership of Sahana, we have self-deployed and this will be a likely successful model for the future. More and more, technology projects are going forth and doing good directly.

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