Managing Disasters
Sahana, Sri Lanka

Summary

Sahana is a disaster management system that grew out of the 2004 Asian tsunami disaster that devastated many of the countries in Asia bordering the Indian Ocean. In Sri Lanka, one of the countries hardest hit by the tsunami, ICT volunteers put together the Sahana Disaster Management System to help track families and coordinate work among relief organizations during and after the tsunami disaster. Subsequently, Sahana has been deployed to manage the earthquake disaster in Northern Pakistan (2005), the Guinsaugon landslide in the Philippines (2006) and the earthquake in Yogjakarta, Indonesia (2006).

Sahana is developed on a FOSS platform using the LAMP software stack and is made available as FOSS itself. A major advantage of having a FOSS disaster management system is that it can be readily distributed, localized and customized according to the requirements of the region or community using it and poor countries can also afford to use it. Sahana consists of a series of integrated web-based disaster management applications aimed at facilitating the management of missing people and disaster victims; managing and administering various organizations; managing camps; and managing requests and assistance in the proper distribution of resources. A new and improved version of Sahana, Sahana Phase II, is now being rolled out. This version is more flexible and powerful and can cater to more general types of disasters.

Sahana is being developed and maintained by a dedicated team of six full-time developers with assistance from the worldwide FOSS community. A key challenge for the Lanka Software Foundation (LSF), the non-profit organization that oversees the project, is to ensure that it receives adequate sponsorships to be able to support the core development team.

The success of Sahana and its availability as FOSS opens up the possibility of international aid agencies and relief organizations as well as national governments to have a single cohesive disaster management system. This will make disaster management and the associated relief effort much more efficient. It will also allow regions that frequently experience natural disasters to better prepare themselves to deal with the disasters as and when they arise.

The Sahana Project has inspired the concept of "humanitarian-FOSS". This is a term coined to denote the application of FOSS to alleviate human suffering. Such a concept can be used to bring together many volunteers around the world to build and contribute to worthy FOSS projects that can benefit mankind.

Background of Organization

LSF is a non-profit foundation in Sri Lanka that encourages Sri Lankan software developers to participate in global FOSS projects. It sees FOSS as playing an important role in the development of the country by providing an opportunity for the local ICT industry to participate in the global ICT market. It believes that FOSS can reduce the cost of ownership of large-scale software deployments and play an important role in e-government solutions. To realize its mission, LSF nurtures the local FOSS software development environment to attract developers from local companies to participate in LSF FOSS projects. It does this by providing the necessary physical, technical and financial resources to

support FOSS developers as well as play a key role in the promotion and coordination of FOSS activities and projects in the country. It also promotes FOSS actively to the local universities so as to influence and attract the undergraduate students to FOSS.

LSF is run solely on the support that it receives from its sponsors, which include commercial companies, international aid agencies, universities and individuals. This assistance may be in the form of financial assistance, equipment and infrastructural aids, services and human resources. The software developers in LSF consist of people seconded from various companies, contract staff, and industrial placement students.

Objectives of Project

Sahana is a disaster management system. It was created in the aftermath of the 26 December 2004 tsunami disaster that hit 12 countries in Asia bordering the Indian Ocean. Among the countries most severely affected by this disaster was Sri Lanka where nearly one million people were impacted. While help and relief poured in from all over the world, a disaster management system was needed to coordinate them and to maximize the impact on the affected people. As there was no software of this nature readily available, volunteers predominantly from the Sri Lankan ICT industry quickly put together the Sahana Disaster Management System over two or three weeks and it was officially used to track families and relief organizations during and after the tsunami crisis in Sri Lanka.

The primary objectives of Sahana are to facilitate the management of missing people and disaster victims; manage and administer various organizations; manage camps; and manage requests and assistance in the proper distribution of resources. The system consists of a set of integrated web-based disaster management applications. The main applications and problems they address are:

- Helping to reduce trauma by effectively finding missing persons;
- Coordinating and balancing the distribution of relief organizations in the affected areas and connecting relief groups allowing them to operate as one;
- Registering and tracking all incoming requests for support and relief up to fulfilment and helping donors connect to relief requirements; and
- Tracking the location and numbers of victims in the various camps and temporary shelters set up all around the affected area.

FOSS Application

Description

Sahana is a suite of web-based applications that provides management solutions and addresses different problems with regard to the information required for managing coordination problems in the aftermath of a disaster. It provides the four main solutions listed below.

- Sahana Missing Person Registry – an online bulletin board of missing and found people. Information on the person seeking them is also captured, which adds to the chances of people finding each other;
- Sahana Organization Registry – keeps track of all the relief organizations and civil society groups working in the disaster region. It captures not only the places where they are active, but also captures information on the range of services they are providing in each area;
- Sahana Camps Registry – keeps track of the location of all the camps in the region and provides some basic data on the facilities they may have and the number of people in them. It also provides a GIS view to plot the location of the camps in the affected area; and
- Sahana Request Management System – a central online repository where all relief organizations, relief works,

government agents and camps can effectively match requests of aid and supplies to pledges of support. It effectively looks like an online aid trading system tracking request to fulfilment.

Choice of FOSS

Very few countries and organizations (rich and poor alike) can afford to invest a lot of resources in disaster management when there is no disaster present because there are always higher priorities that need the funding. There are also few proprietary software applications for disaster management as practically and ethically it will be difficult to impose strict licensing terms during humanitarian disasters and times of crisis. A system built with FOSS and made available as FOSS can overcome these issues. FOSS development tools can be obtained free of charge and the FOSS software development model encourages worldwide volunteer and community involvement. With FOSS there need not be any delays in getting permission for a license as anyone has the freedom to download the software and use it. Also such systems should be developed and shared globally as the problems and needs they address are difficult for a country to deal with when a disaster strikes. The FOSS development and community mechanisms have a proven track record to build, distribute and maintain such global systems.

The choice of FOSS makes the system open and transparent and is more likely to be trusted by all parties involved in the disaster relief effort. This is important as during such trying circumstances, tensions and problems can arise among the parties involved.

As no two disasters are alike, often localizations and customizations are needed for the software before it can be applied effectively to a disaster. With FOSS, the code is available for anyone to quickly pick up and make the necessary customizations without restriction.

Thus, it can be seen from the discussion above, a disaster management system developed and implemented as FOSS is very appropriate. It is possible to develop such systems at a much reduced cost compared to pure commercial development models. A small team is needed to drive such a project to ensure the quality of the product and this team can then be assisted by the global FOSS community to develop a good quality disaster management system. This is the working arrangement for the Sahana Project with a core team of six people assisted by a global community of over 60 participants and contributors. The FOSS community spirit, philosophy and mechanisms have been the key ingredients in the successful growth of such a vibrant community for Sahana.

Development and Implementation

The original Sahana system (now known as Sahana Phase 1) was put together immediately after the Asian tsunami disaster struck, amidst the chaos, by volunteers in Sri Lanka. Sahana Phase I was built as a collection of interconnected, yet independently usable, subsystems that interact with each other via a set of shared databases. The well-known FOSS LAMP solution stack was used as the platform to run these applications. The operating system used was Debian GNU/Linux, Apache was the web server, MySQL was the database, and the PHP or Java language was used to write the applications.

Sahana Phase I components were built in a chaotic situation and were very much a hack for the requirement at hand. Following this initial development, the Sahana Project entered Phase II in August 2005. Sahana Phase II is also developed using the LAMP stack but it has a more structured development team and process. The Phase II model has a core team ensuring the quality and stability of the Sahana releases surrounded by a developer community. This model is very similar to the development model for the Mozilla Firefox project. The core team of six people is sponsored by the Swedish

International Development Cooperation Agency and overseen by LSF in Sri Lanka. Currently, the majority of development happens in Sri Lanka whilst a global community of over 60 persons contributes in various areas. The community includes emergency management experts, humanitarian consultants, academic and FOSS developers, all currently working together towards the success of the Sahana system. Formal support at the organization level currently comes from the IBM Crisis Team and LSF.

Sahana will run on most popular operating platforms including GNU/Linux, xBSD, Mac OS X and Microsoft Windows.

Deployment

At the time of writing, Sahana had been deployed to assist in the management of several disasters:

- Sri Lanka tsunami disaster in 2004;
- Pakistan earthquake disaster in 2005;
- Philippines Guinsaugon landslide in 2006; and
- Indonesian Yogjakarta earthquake in 2006

For the Sri Lanka tsunami disaster in 2004, Sahana was adopted by the Sri Lankan government as part of its official portal for the Centre of National Operations (CNO), the main government body in Sri Lanka coordinating the relief effort. An implementation of Sahana was deployed by CNO to help coordinate all the data being captured and at the end of its tenure it had captured data on over 32,000 families and most NGOs operating in the tsunami-affected region of Sri Lanka. For this deployment, the main Sahana components that were utilized were the Organization Registry and the Missing People Registry. The deployment model included distributed data entry of "Gramasevaka" data and police data and authorized volunteers were given access to upload the data into the system, coordinated by the universities. As the hardware resource requirements were low it

was initially deployed on a standard desktop computer, but it was subsequently migrated to its own dedicated server. It was tested and found that it could also be deployed on a resource limited equipment like a Personal Digital Assistant (PDA) such as the iPAQ with OPIE (a GNU/Linux distribution supporting iPAQs) within 64 Mb of RAM.

After the North Pakistan earthquake in 2005, the LSF Sahana team was invited to Pakistan by the IBM Crisis Team and IBM Pakistan. Sahana was localized for use in Pakistan and training was given to the teams there to use the system. Since Sahana Phase II was not ready yet, Phase I was deployed in Pakistan. To ease the deployment, a live CD was created based on the Taprobane distribution of GNU/Linux. In Pakistan, Sahana filled the gap of making the data from the government's people database accessible to the other organizations involved in the relief effort. This was needed as although the Pakistani National Database and Registration Authority (NADRA) has built and maintained a comprehensive database on the people of Pakistan, access to this system is not web based and it is under tight security control. LSF, IBM Pakistan and the IBM Crisis Team worked with NADRA to train their personnel on customizing Sahana for use. After that NADRA took ownership of integrating and deploying Sahana in Pakistan.

Sahana was customized for use in the Guinsaugon landslide in the Philippines in March 2006. It was used to facilitate effective coordination and information-sharing among the National Disaster Coordinating Council member agencies, private sector and civil society groups involved in disaster response, relief and rehabilitation.

Sahana was deployed to assist with the management of the relief work following the earthquake in Yogjakarta, Indonesia in May 2006. The system was operated by the Indonesian Whitewater Association and the Indo-

nesian Rescue Source, two organizations that undertook relief support work after the eathquake. Technical support was provided by the UrRemote[22] group and the deployment was sponsored by the Communications Technologies Board of the Australian Computer Society.

Impact

In any disaster situation, getting the right information out to the correct parties is critical to alleviating human suffering and saving lives. Furthermore, for a national or international disaster, the scale of the operation will mean that in order to be able to account for each and every individual equally from their medical needs to reunification with family, to their relief supplies, a proper disaster management system like Sahana has to be put in place to help manage the data and information. The impact that Sahana has on the people in the regions and communities that suffered the disasters probably cannot be quantified with words in a document such as this. Through the disaster and relief management made possible by the Sahana system, relief effort was made more efficient and because of this, more lives were saved and the victims were able to have access to vital resources more quickly.

The success of Sahana and its availability as FOSS means that for the first time it is possible to have a single cohesive disaster management system that international aid agencies and relief organizations as well as national governments can use. If this can be realized, it will make disaster management and the associated relief effort so much more efficient and beneficial for both givers and receivers alike.

The Sahana Project has inspired the concept of "humanitarian-FOSS" which is effectively the application of FOSS to alleviate human suffer-

ing. This concept does not just apply to disaster management, but it extends to humanitarian ICT or any other ICT activity or product that concerns the improvement of human welfare. One major impact of this is that if such a concept is positioned and promoted properly there can be many volunteers flocking to build and contribute to such projects globally, as the FOSS community is well known for its strong beliefs and actions for the benefit of the community at large.

Lessons Learned

Based on the experiences in deploying Sahana in several disasters in Asia, the Sahana team has learned some valuable lessons.

First and foremost, it is vitally important to get the system accepted and approved by authorized relief coordinators. This is to enable everyone to operate as one, using one dataset. There is no better way to do this than have the relief coordinators (usually from the government) authorize the deployment of a disaster management solution.

The disaster management system should be built on open systems so that all relief groups can work together and the data contained within should be accessible to the parties involved. Sometimes problems can arise in which the government entity responsible for deploying the software is reluctant to share it with NGOs. Any disaster management portal that prevents access to NGOs or civil society or government is a partial solution and will result in yet another parallel silo of data. The parallel silos of data tend to cause more confusion as no proper data consolidation can take place.

The organization of dedicated teams to provide localization, customization and helpdesk services should be done immediately. Disaster en-

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[22] The UrRemote initiative is based in the Electrical Engineering Department of Udayana Universiity, Bali in Indonesia, It attempts to provide opportunities for students to engage in research and development and gain experience by working remotely with overseas (mainly Australian) organizations. http://urremote.com/index.php?title=UrRemote.com:About

vironments have requirements and deadlines that are needed as soon as possible. Every disaster yields different requirements and no matter how well the system is built, there will always be urgent requirements on localization, customization and helpdesk application support. Thus, when deploying Sahana it is better to have a dedicated professional team to support it. It is also worthwhile setting up a helpdesk/call centre to help users become accustomed to the application and enter data on their behalf (especially in nations with low ICT literacy).

The system has to be flexible enough to cater to the evolving granularity of data. This is because during the initial stages of the relief effort, there may not be enough time to be sifting through all the relief supplies coming in and working out the exact quantities of each package or box when people are starving and dying. However, later as operations are streamlined and things settle down, a smaller granularity to the data tracked can be introduced to improve the efficiency and transparency of aid distribution. The applications need to be built to be able to handle this sparseness of data at the initial stages.

Current Status of Project

As noted earlier, the Sahana system is being re-engineered and written to follow a more structured development process and team. Sahana Phase II still adheres to the LAMP platform but it is more generic in being able to handle any disaster scenario from a tsunami to an earthquake to a pandemic. The entire system is internationalized to allow easy localization to a particular country. Applications in Phase II conform to a base application framework making it easier to write a new disaster management component. It also caters to the integration of third party modules/sub-applications into it. Other features include better security features to protect privacy of data, the support of more operating systems

and databases, adhering to existing emergency management and humanitarian data exchange standards and the support of pervasive technologies such as text messaging using mobile phones.

Benefits and Challenges

Many nations affected by natural disasters such tsunamis, earthquakes and floods are often poor and so can ill-afford to spend money and resources to develop or purchase disaster management systems. This means that a system like Sahana, which can be obtained free-of-charge and be freely customized to suit local needs and circumstances, has tremendous benefits to these countries. The use of FOSS enables the local people to take over the system for further development and deployment based on their needs. The Sahana system has successfully helped the people in several national disasters.

The project has brought good publicity to the Sri Lanka ICT community and its FOSS community in particular. With this positive image of FOSS, it is hoped that more organizations in the country, both commercial and academic, as well as the government can promote and support more FOSS projects both at the local and international levels.

To ensure that a country is prepared to handle a disaster situation, it has to be in a state of preparedness and Sahana can help it achieve this. Towards this end, the Sahana team is working closely with NGOs, civil society groups and government bodies to pre-deploy Sahana installations globally in order to improve adoption and disaster preparedness when the next large-scale disaster strikes.

While the benefits from Sahana are obvious, it nevertheless faces challenges in its continual development and progress. It is essential that LSF receives adequate sponsorships and cooperation to be able to support the core Sahana development team. Without a dedicated team, it

will be difficult to ensure the continuous development of the system.

Other Information

Sahana has gained a tremendous amount of recognition for the project and for the concepts it promotes. The project and the people associated with it have received numerous awards.

The IBM Crisis Team proactively promotes the use of Sahana for disaster management.

Conclusion

The Sahana Disaster Management System from LSF has shown how ICT can play an important role in times of disasters to manage and coordinate the relief and humanitarian efforts. The use of FOSS for developing Sahana and its availability as FOSS is significant in that it is easily and freely available for any country or community to use both in times of disaster and also in preparing for disasters. Releasing it under a FOSS license makes it easier to customize and localize the software, a key requirement in most situations.

Sahana has demonstrated that it is possible to develop such a system at a much lower cost compared to commercial proprietary software if there is a small dedicated team, assisted by the global FOSS community, to drive the effort.

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Websites

The Sahana project website
http://www.sahana.lk
http://cvs.opensource.lk

Sahana Wiki
http://www.reliefsource.org/foss/index.php/Sahana

The Lanka Software Foundation website
http://www.opensource.lk

Awards and Recognition Received by Sahana

The Sahana Project and the people associated with it have received awards and recognition internationally. Below are some examples:

FSF, known as one of the two leading organizations responsible for the FOSS movement, has created a new award based on humanity, which was directly inspired by Sahana. Ref: http://www.tectonic.co.za/view.php?id=686 http://www.fsf.org/news/social-benefit-award.html

Dr Sanjiva Weerawarna, founder of LSF, received a Red Hat[23] User Summit award for inspiring the Sahana system. Ref: http://www.redhat.com/magazine/008jun05/features/awards/

The Sahana Project at Sourceforge was named project of the month for June 2006. Ref: http://sourceforge.net/potm/potm-2006-06.php

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[23] Red Hat Corporation is one of the leading commercial Linux vendors in the world.