Can Student-Written Software Help Sustain Humanitarian FOSS?

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ABSTRACT

This paper describes a Humanitarian FOSS (free and open source software) project carried out by a team of students and faculty at Trinity College. The project outcome was a volunteer management module that has recently been incorporated into the Sahana Disaster Recovery IT System. The Humanitarian FOSS movement is based on two premises: (1) that quality humanitarian software can be built and given freely to governments and organizations in need of such software ; and (2) that the FOSS development model can successfully harness the contributions of humanitarian-minded IT and computing professionals. The Trinity Sahana project introduces a third premise: (3) that students and faculty whose main goals are educational and pedagogical can contribute successfully to the Humanitarian FOSS movement. This paper examines these three premises focusing on the question raised by the third.

Keywords

FOSS, free & open source software, humanitarian software, volunteer management, disaster relief

INTRODUCTION

Humanitarian FOSS (H-FOSS) refers to free and open source software that is built to serve humanitarian purposes. We use the term *humanitarian* broadly, including software used to manage volunteers for a non-profit social service organization as well as software to assist in disaster recovery efforts.

The H-FOSS movement is based on two premises [Humanitarian FOSS]:

(1) That quality humanitarian software can be built and given freely to governments and organizations that could not otherwise afford to purchase or develop such software.

(2) That the FOSS development model can successfully harness the contributions of large numbers of IT and computing professionals in the Humanitarian FOSS enterprise.

The first premise is met in the case of the Sahana project, which, over the past two years, has demonstrated that it is possible to develop powerful Humanitarian FOSS. *Sahana* (Sinhalese for *relief*) was started in Sri Lanka by a group of IT developers. [Sahana; De Silva *et al.,* 06] It is a web-based tool that addresses the intra-organization coordination problems that can occur during recovery from a large-scale disaster. Sahana has been deployed in a number of natural disasters, including in Sri Lanka during the 2005 Tsunami, in Pakistan during the 2005 earthquake, in the Philippines during the 2006 mudslide, and most recently in Jakarta during the 2006 earthquake. The Sahana project has received numerous awards for its humanitarian efforts.

Although Sahana is a demonstrated H-FOSS success, the question remains whether its success can be generalized. For an H-FOSS movement to succeed, it is necessary to harness the cooperation and support of IT and humanitarian professionals. Sahana's continued success on this score has been helped by funding from the Swedish International Development Cooperation Program (SIDA) and by connections with humanitarian consultants and disaster recovery experts [Treadwell. 06]. With around 150 members on its list server, the Sahana community appears to have reached a level of stability and critical mass that is necessary for its continued growth and success [Reliefsource, Humanitarian ICT].

We propose that another way to help grow the H-FOSS community is to engage undergraduate computer science and IT students in the endeavor. This introduces a third premise:

(3) That undergraduate computing students can contribute successfully to sustaining the H-FOSS movement.

To support this idea, we will first describe a successful student-based H-FOSS project. We will then describe a model that can be used to generalize and scale this approach to H-FOSS.

The Trinity Sahana Project

The Trinity College Sahana project began in January 2006 as an experiment in undergraduate computer science and software engineering education. In response to a call by ACM president David Patterson for computer science educators to get involved in the open-source movement, we considered whether or not the Sahana system could provide an appropriate platform for studying open-source software development [Patterson, 2006]. At the same time, we were also aware of Patterson's eloquent call, in the aftermath of Katrina, for computer scientists to help our neighbors [Patterson, 2005]. Patterson's hypothesis was that through using our computing and IT skills to help our communities in times of need, we would improve the image of the computing discipline and draw more students into our classrooms.

The Trinity College Sahana project began when a Trinity department member encountered members of the Sahana core team during a January 2006 visit to the University of Colombo. An initial investigation into Sahana demonstrated that it had the potential to test Patterson's hypotheses. During a spring 2006 assessment of the educational potential of the Sahana platform, we discovered that our students were able to adapt easily to Sahana's LAMP (Linux/Apache/MySQL/PHP) architecture. It was also apparent that the Sahana project itself provided students a unique opportunity to work on a real-world software system. What was needed was a real project.

In January 2006, the Trinity team was introduced to a group of volunteer professionals (including several from Accenture) who saw the value of bringing innovative technology to humanitarian agencies. These volunteers had recently worked on the development of a website called KatrinaShelter.com in the aftermath of the deadly hurricane. Using open-source principles, KatrinaShelter.com was built to match displaced victims with available shelter. The group realized the potential for open source software but wanted to focus their efforts on more measurable endeavors. Through subsequent dialog with the National Volunteer Organizations Active in Disaster (NVOAD) we identified volunteer management as one of the major challenges associated with disaster relief. The Trinity and Accenture groups pooled their efforts to design and build a Volunteer Management (VM) module for the Sahana system. The initial requirements for the module were developed in cooperation with NVOAD committee members, including representatives of the Federal Emergency Management Agency (FEMA) and Points of Light. The main requirement of the VM module is to support the registration of relief volunteers and their assignment to projects.

Working through the summer, with the main programming effort coming from students, a prototype of a VM module was developed. The module provides both a *registry* for volunteers and a *management* interface for volunteer coordinators and project leaders. It includes messaging and search functions and provides portals for both volunteers and project managers. It also provides a report generation facility that gathers summary data on the billable hours of service provided by volunteers on a particular project or from a particular organization. Although they were developed independently, the VM module's functional requirements conform fairly well with the requirements identified as part of a comprehensive study done at Georgetown University [Barbera *et al.,* 2006]. The fact that there is consensus on what goes into a VM module and the fact that many social service organizations have a need for VM functionality may provide additional demand for Sahana and broaden the user community needed to help sustain H-FOSS projects.

In June, a prototype VM module was presented at the National Conference on Volunteering and Service, Seattle Washington. In August, a more complete prototype was field tested at the Strong Angel III Disaster Response Demonstration in San Diego [StrongAngel]. The volunteer registry/management module was used to register all of the participants in the Strong Angel III event. Further details on these efforts are available in [Ellis *et al.,* 2007a].

In Fall 2006 an independent study course focusing on H-FOSS expanded the student development effort to include students from Connecticut College and Wesleyan University. At the same time Trinity's Sahana team continued to extend and refine the VM module. In December, the VM module was accepted into the most recent Sahana release. Plans are currently underway to deploy the VM module with the Sri Lankan Red Cross, who will use it to manage volunteers in several of their offices. A spring 2007 course focusing on H-FOSS is currently engaging 25 students from Trinity, Connecticut College, and Wesleyan University in the continued support and enhancement of the VM

module as well as other H-FOSS efforts. Moreover, plans are underway to hold a humanitarian open-source development institute at Trinity in the summer of 2007. The institute will provide internships for five students to continue work on the VM module and other H-FOSS projects.

The Trinity Sahana project has been an interesting (and we think successful) pedagogical experiment. We have previously reported on the pedagogical motivations and outcomes of the first phases of this experiment [Ellis *et al,* 2007a] and on the software engineering details and potential benefits of the open-source model in software engineering education [Ellis *et al.*, 2007b]. The main focus of this paper is to address if and how such academic-based projects can successfully serve the needs and goals of the H-FOSS movement in a sustainable fashion.

EXTENDING H-FOSS TO HIGHER EDUCATION

The Sahana core team has recognized that the education community so far is a largely untapped pool of technical talent and has included undergraduate students on its core development team as well as reaching out to academic institutions, such as evidenced by the Trinity Sahana project. Based on our positive experience with Sahana, we have submitted a National Science Foundation (NSF) proposal to develop a portable and extensible model for growing the H-FOSS movement within the higher education community through collaboration with professional and non-profit organizations.

A Portable and Sustainable Model for H-FOSS Development

The basic idea is to build a cooperative community consisting of three types of organizations: academic computer science departments, social service organizations, and major computing and IT corporations. The incentives for the different organizations are disparate but compatible. First, the academic departments are interested in finding ways to teach their students about FOSS and students are eager to gain FOSS skills. Second, social service organizations are interested in obtaining help in acquiring or developing software that serves their missions. Because many such organizations cannot afford to buy or develop proprietary software, FOSS would seem to be attractive to them. Third, corporations are interested in providing productive volunteer opportunities for their employees and with recruiting talented students. In addition to this set of separate incentives, all three types of organizations have a shared incentive to engage in humanitarian and socially beneficial activities.

The model we propose outlines general roles for students. Students work together with faculty and computing professionals to design, build and maintain H-FOSS. This work can go on during the academic year and during summer internships, many of which could be hosted within companies like IBM or Google or within social service agencies like the Red Cross or Habitat for Humanity. H-FOSS capabilities could be developed in cross-functional teams independent of location as well as on a local or neighborhood scale. For example, teams of developers could be contributing to the Sahana project while other teams could be customizing the VM module for the neighborhood homeless shelter or the local Habitat for Humanity office.

Finally, computing and IT corporations provide support through financial and technical resources to drive development as well as marketing and advertising resources to promote the H-FOSS movement. The *portability* of the model stems from the fact that participants can easily create a small community of academics (including students), social service organizations, and corporate sponsors in their locales. As word spreads and the community grows, resources can be developed to help computing departments and humanitarian organizations find each other and get involved. The *sustainability* of the community or communities derives from the fact that all participants are getting something out of it that serves their interests.

In our case, our discussions with relief agencies about the lack of tools and technologies combined with our analysis of the VM market suggests that there may be a real need for such H-FOSS software in this domain. Volunteer management is needed in nearly every humanitarian development organization—including projects such as Sahana—and the disaster relief community would benefit from the development of interoperable standards. Thus a global effort aimed at developing VM modules that could be used either as a standalone product or as part of a disaster recovery system would help sustain a project like Sahana during those periods between disasters when volunteer enthusiasm is somewhat diminished. Similarly, assuming sufficient corporate financial support, this model avoids some of the problems associated with relying purely on volunteer effort. The students would be working at paid internships and in credit-bearing courses, which would make it somewhat easier to assign them tasks that required attention.

CONCLUSION

In this paper we have described a successful student-based H-FOSS project that demonstrates, albeit on a small scale, that students and faculty whose main goals are educational and pedagogical can contribute successfully to the Humanitarian FOSS movement. We have also outlined an H-FOSS development model that attempts to harness the availability and enthusiasm of the undergraduate computing community and focus it, with financial, technical, and marketing support from the corporate community, on fulfilling the software needs of humanitarian and social service organizations. Admittedly, merely proposing a model raises more questions than it answers. We believe we have seen signs of the necessary enthusiasm on the academic side—already a few other colleges have joined in the project and several others have expressed interest in the model. But, will the corporate community step forward with sufficient resources to support developers and market this idea on a broad enough scale? Will humanitarian and social service agencies see H-FOSS as a way to address their needs and will they join the movement? Will the disparate communities involved—academic, corporate, humanitarian—be able to work together successfully? These are the questions—empirical questions—that lie ahead.

REFERENCES

1. Barbera JA, Macintyre AG, Shaw GL, Westerman LT, Seefried V, Fiedrich F, de Cosmo S. (2006) Standardized Volunteer Management System for Public Health & Medical Emergency Response & Recovery; *The Institute for Crisis, Disaster, and Risk Management, The George Washington University.*
2. De Silva C., De Silva R.,Careem M., Raschid L. and Weerawarana S. (2006) Sahana: Overview of a Disaster Management System. *Proceedings of the IEEE International Conference on Information and Automation (ICIA)*.
3. Ellis, H., Morelli, R., deLanerolle, T., Damon, J, and Raye, J. (2007a) Can humanitarian open-source software development draw new students to CS?, *Proceedings SIGCSE-2007*, forthcoming.
4. Ellis, H., Morelli, R. deLanerolle,T, and Hislop, G. (2007b) Holistic software engineering education based on an open source humanitarian project. *Proceedings 20th Conference on Software Engineering Education and Training (CSEET),* forthcoming.
5. Humanitarian FOSS, http://en.wikipedia.org/wiki/Humanitarian-FOSS.
6. Humanitarian ICT mailing list. http://groups.yahoo.com/group/humanitarian-ict/.
7. Patterson, D. President's Letter. *CACM, 49, 3* (Mar. 2006), 27-30.
8. Patterson, D. Rescuing our families, our neighbors, and ourselves. *CACM, 48, 11* (Nov. 2005), 29-31.
9. Points of Light Foundation http://www.pointsoflight.org/
10. Sahana. http://www.sahana.lk/.
11. Strong Angel III, http://strongangel3.net.
12. Raymond, ES., (1999) The cathedral and the bazaar. http://www.catb.org/~esr/writings/cathedral-bazaar/cathedral-bazaar/
13. Relifsource WIKI, http://www.reliefsource.org/foss/index.php/Main_Page.
14. Treadgold, G. (2006) Sahana-Engineering a sustainable ICT solution for disaster management. Digital Earth '06 Summit on Sustainability, Auckland, NZ, August, 2006.