

# Motivating a Discussion about Enterprise Computing Education for a Cause

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## ABSTRACT

Recently there has been an increase in large scale volunteer-driven computing projects, the incorporation of service learning into computing curricula, and an emphasis on students gaining experience from distributed teamwork. This paper discusses the implications of these trends for enterprise computing education, as well as describe Software for a Cause, a pilot program inspired by these trends.

## Author Keywords

service learning, education, collaborative software development

## INTRODUCTION

Improving student enrollment, motivation, retention, and diversity is of interest to computing educators in general. Various approaches to address these issues include outreach programs[18], senior capstone projects with open source and business partners[15], video games[29], and Web 2.0 competitions[1]. This paper focuses on another approach being explored by computing educators: computing driven by humanitarian causes and community service[28][27]. This includes the use of service-learning based projects[25], summer programs based on free open source software for humanity[26], and the design of assignments around socially meaningful concerns[24].

We believe computing projects for humanitarian causes offer useful examples for the enterprise computing community, and would like to use this paper to start a discussion about the potential opportunities. We raise questions for discussion by examining recent examples of computing projects for humanitarian purposes being mobilized by volunteers at a large scale. We then look at how computing educators are currently integrating ideas from these efforts into their own curricula. Next, we discuss our work in progress with Software for a Cause, a pilot program hosted at Marist College and run in partnership with McGill University and the University of British Columbia. We conclude with a discussion about future opportunities for collaboration with the enterprise computing community.

## COMPUTING FOR A CAUSE

To motivate our discussion about the potential opportunities for enterprise computing education, we will examine

three types of activities: disaster relief, scientific computing research, and government transparency. Each involves attributes of interest to enterprise computing projects: scale, coordination, and data analysis.

### Disaster Relief

The 2004 Asian tsunami sparked the development of Sahana, an open source disaster management system that received support from IBM crisis response teams[21]. Relief efforts for various disasters over subsequent years, including the recent events in Haiti and Chile - continued this trend of volunteers from the computing community developing solutions at a large scale to support governmental, professional, and non-profit relief organizations. Events such as Random Hacks of Kindness and Crisis Camps helped bring the computing community together with experts, and increased awareness of the need for computing projects to help with disaster relief[14][3].

Open projects have emerged where volunteers can contribute code, services, and data. For example a recent article from Forbes documented the use of open source tools such as Ushahidi and OpenStreetMap combined with SMS infrastructure for disaster relief in Haiti[22]. These tools were often used to coordinate and manage teams and data, but were targeted at relief workers and support organizations rather than office workers and enterprises. Another aspect of coordination involved the work around hardware and network infrastructure that enabled a global community to connect with workers on the ground. For example, the IEEE described some of the telecommunications and internet connectivity work behind the scenes in Haiti[23].

Besides providing case studies, these efforts raise interesting questions for the enterprise computing educator to help develop new curricula. Are there opportunities for educators and students to get involved and connect with this community? Are there scenarios that are worthy class projects? Is there a connection between the logistics of enterprise disaster recovery and the logistics of IT volunteer disaster relief?

### Scientific Computing Research

Another form of humanitarian computing is the use of high performance computing to conduct scientific research. Such research is used to help find vaccines, treatments, and cures for diseases, understand biodiversity, and model the Earth's natural resources and climate.

A notable example, in which Marist College is a major participant[9], is the World Community Grid, which provides a platform for volunteers to choose to participate in a variety of projects, and helps researchers develop and distribute their computing projects[16]. Another interesting example is the University of California Riverside and Stanford University's Quake-Catcher Network, which leverages the growing number of laptops with built in sensors which can be used to sample earthquake tremor data[13].

Leveraging high performance computing to analyze business data is not that far off from some of the analytics performed in scientific research. So, the question for the enterprise computing educator is: What kinds of scientific research problems are suitable for class problems? Is there an opportunity to partner with scientific research in other departments on new projects? Are there lessons learned from scientific research computing that can help enterprise computing, and vice versa?

### **Government Transparency**

There is growing interest from the federal, state, and local governments to provide large amounts of data for public consumption. For example, the Massachusetts Department of Transportation makes available real-time and static transportation data[10]. Various organizations, notably nonprofits, are taking advantage of this to perform analytics and visualizations some of which reveal new insights[5]. An interesting example is the UK-based Guardian news organization, which developed a popular application that allowed the public to scrutinize and annotate UK elected officials' expenses[4]. Another example is IBM Many Bills, which lets the public visualize and inspect complex US congressional legislation[7]. There is also an interesting proposal to form an "IT peace corps" to make government information systems more manageable[19].

Governments are also encouraging organizations to leverage their data in innovative ways through such programs as Code for America[2] and competitions such as the MassDOT Real-Time Challenge[10] and the City of New York's NYC Big Apps contest[12].

Government computing and enterprise computing have a common heritage. What has changed is the increasing interest in making government data more openly available to the public and enabling others to analyze and visualize this easily. Does this present new opportunities for enterprise computing educators? Can this public activity form the basis of new classroom projects and assignments for students? In addition to programming contests, are there new venues for students to practice their enterprise computing expertise in a slightly different context?

### **COMPUTING EDUCATION FOR A CAUSE**

Computing for a cause efforts have inspired institutions to develop new curricula. In this section we cite examples from courses, senior student projects, and programs.

There are many papers documenting course experiences. For

example, Sanderson provides an overview and survey of service-learning in computing, and presents examples at various universities and colleges[28]. Purewal et al. identify the different types of service-learning courses, discuss issues such as evaluation, and present the details of a foundational course[27]. These courses often combine readings, in-class discussion, guest lectures from experts, and hands-on projects to help students to think about the societal aspects of computing.

Senior student projects are useful to provide students experience in working as a team for a real-world customer. Often these projects have a humanitarian angle. For example, the University of Washington includes capstone computing projects which help local communities and underserved populations[17]. The long running EPICS program, started at Purdue, presents an example of service learning computing projects[25].

Outreach efforts and entire programs are also being developed. "Georgia Computes!" is a partnership between GeorgiaTech educators and the local community to do computing outreach and education, targeting under-served populations[18]. Another notable example is the HFOSS program developed by Trinity College, Connecticut College, and Wesleyan College[26]. This program helps students use free open source software development methodology to work on humanitarian open source projects such as the aforementioned Sahana project. The organizers are now reaching out to other universities and colleges in a series of SIGCSE symposia to build a community of similar-minded educators[6]. The National Academy of Engineering is also discussing the introduction of teamwork, global collaboration, and service learning into the national engineering curriculum at the Boston Grand Challenge Summit[11].

While none of these examples focus on the specific needs of enterprise computing, these efforts should help inspire the enterprise computing community with new ideas. For example, Cai motivates the need for greater awareness of environmental sustainability in computing and describes the design and evaluation of his green computing course[20]. This theme of environmental sustainability ties well into the need for greener data centers and the use of efficient server setups instead of commodity server farms for enterprise computing.

### **SOFTWARE FOR A CAUSE**

"Software for a Cause" is our own foray into computing education for a cause. Here we present our program's objectives and its current status as we move towards a Fall 2010 pilot.

Our pilot program, "Software for a Cause", has three purposes. First, to give students hands-on experience working together on distributed software development projects, similar to programs like UCOSP[15]. Second, to motivate students with an interesting context. Thus we want to focus projects to help humanitarian charitable organizations, similarly inspired by the various examples discussed in the previous sections. Third, to explore how well an integrated enterprise team software development product like IBM Rational Team Concert[8], which is intended to help teams plan, as-

sign tasks, share code, and work together, would fare in this context.

Rational Team Concert consists of an Eclipse-based client for students to conduct their work and a server which acts as a project repository and hosts a web-based interface. To host the server, we are partnering with Marist College, which is setting up an online Rational software hub for educators. Marist's service will allow instructors to focus on teaching rather than server software installation and administration.

We have partners at McGill University and the University of British Columbia who plan to involve their students in a distributed team project hosted on the Marist hub. The details of the project are still under discussion with the Canadian Cystic Fibrosis Foundation. We plan to flesh out the project along with any necessary supporting infrastructure and materials over the summer. To ease technology transfer to the Foundation and help with future work, the software developed for the project will be made open source under the Eclipse Public License.

## DISCUSSION

This paper examines existing efforts to use computing for a cause, how educators are bringing this into their curricula, and our own progress in this space. Each of these examples highlight opportunities for enterprise computing educators. Volunteer driven computing projects for a cause - whether it is for disaster relief, scientific research, or government transparency - involve scaling, coordination, and data management issues that are highly relevant to enterprise computing. A growing number of courses, capstone projects, and programs provide material to draw inspiration from. Also, charitable organizations are becoming more technology savvy and may eventually grow to need the resources and skills offered by the enterprise computing community.

We hope the examples in our paper, particularly our efforts to use IBM software tools hosted on enterprise-class infrastructure at Marist in our own pilot program, will open a discussion with the enterprise computing education community. Lessons that we learn from using Rational Team Concert to help facilitate distributed team development might inform software engineering coursework, and may lead to exploring other enterprise tools. The Marist Rational hub has the opportunity to become a springboard for new projects, and act as a repository for sharing course materials - notably reference examples of projects - for instructors across institutions to leverage and improve upon.

Although we are still in the early stages of setting up our Fall 2010 pilot, we are interested in opportunities for deeper collaboration with educators. We believe students, educators, charitable organizations, and enterprises can benefit from exploring together innovative ways to leverage the expertise and capacity of enterprise computing for humanitarian purposes.

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