A New Model for a Student Cyber Security Organization

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ABSTRACT

In response to increasing security needs, many universities have stepped up their curriculum to include courses and even entire degrees devoted to Infrastructure Assurance (IA) and Security. The government has created the Cyber Corps and Information Assurance Scholarship Program (IASP) Scholarship For Service program designed to encourage students to complete coursework in IA by paying year-for-year tuition, books, and a monthly stipend in exchange for government service. Even with these efforts, there are still vast discrepancies between the academic training students receive in security and the practical knowledge needed to perform the job. Given the high profile nature of security, it is difficult for employers to allow new employees the time to learn the needed skills on the job.

We will present a model for a Student Cyber Security Organization whose purpose is to give students extensive hands on experience in the security field through directed research and opportunities to serve the community at large. The members of the organization would gain valuable hands on experience in a directed laboratory environment first, and then take that experience into the community. Ultimately, students would provide valuable services to non-profit organizations, small businesses, and the college campus at large which would translate into quantifiable results to show future employers.

Categories and Subject Descriptors

K.3.2 [**Computers and Education**]: Computer and Information Science Education – *Curriculum, Computer Science Education, Information Systems Education*

General Terms

Security

1. INTRODUCTION

There is currently an emphasis in a number of institutions to have a track or specialty geared specifically towards computer security. There are also approaches that suggest security should be integrated throughout the entire curriculum, not just limited to a track or emphasis. However, regardless of the proposed solution there is still a problem with the current curriculum in computer security. It is difficult to provide students enough practical experience in the field of security in order to be effective in the field upon graduation. Coupled with highly visible nature of computer security jobs, it is difficult for students to gain the experience necessary to hire on with most security firms.

While most institutions have professional organizations geared to technology professionals such as IEEE and ACM, very few institutions have any affiliation with professional security organizations such as the Information Systems Security Association (ISSA) or ASIS. In addition to lacking training, students are being denied the opportunity to network with professionals in the computer security field who could help them secure work related internships and eventually full-time employment.

There are already sub disciplines in the computer field that have successfully addressed the academic gap by creating student organizations that encourage and allow students to take classroom knowledge and apply it in a real world environment. The Laboratory for Recreational Computing (LARC) at the University of North Texas is one such group. Game programming is a very specialized discipline that requires extensive hands on experience in order to be successful. The LARC gives students a place where they can hone their skills and gain valuable experience leading to the eventual procurement of employment in the specialized field of game programming.

By applying some of the same principles to a student cyber security group, the academic gap can be successfully addressed and mitigated. Giving students a test environment where they can learn and then allowing students to perform a service in a live environment is the best method of education possible. This model presents a strong complement to traditional academic training and will provide an even higher caliber of student to future employers.

2. THE LARC

The Laboratory for Recreational Computing (LARC) was established in the Department of Computer Science and Engineering at the University of North Texas by Ian Parberry in 1993 as a center for research and education in computer game development. The Laboratory is a crucible for creativity and originality, and stresses extracurricular educational activity, cooperative learning, and group activity on large programming projects.

LARC is based on the premise that game programming education need not be limited to expensive and private schools. Most of the educational needs of game programmers can be provided by a traditional undergraduate degree program in computer science, augmented by senior level electives on game programming, supported by an open laboratory fostering group activity and cooperative learning. LARC is dedicated to providing the following opportunities to students in the Department of Computer Science and Engineering at the University of North Texas. These are widely recognized as minimal requirements for entry into the computer game industry.

1. Production of student game demos for Windows using DirectX.
2. Experience of having worked on a project that is larger than the typical "write a program for a linked list" project.

3. Experience working with other programmers on a group software project.
4. Experience working with art students from the School of Visual Arts.
5. The opportunity to learn how to learn, fostered by interaction with like-minded students.
6. Knowledge of current game technology, who the important development houses are, and what they are currently reputed to be doing.

2.1 Why LARC Works

LARC is successful for a number of reasons. First and foremost is the practical experience that LARC gives students in their chosen field. The skills gained while working in the LARC are quantifiable to employers and to the students themselves. Employers can clearly see the application of the coursework to the field of game programming and it makes employers much more amiable to providing employment and internship opportunities to LARC students. Students are also able to get course credit for independent research performed while working in the lab. This allows students to focus more of their study time on research as part of their course of study.

Faculty involvement is another factor of the LARC's success. Dr. Parberry takes a personal interest in the lab and its students. The LARC lab is located adjacent to Dr. Parberry's office, allowing him to periodically drop in and see who is there and what the students are working on. Dr. Parberry also takes his involvement a step further by assisting student with problems and giving them guidance and advice on the ongoing projects. The constant guidance and participation from a faculty member motivates the students and gives them constant access to an important resource.

A state of the art lab and equipment are another reason for the success of LARC. PC games are one of the main driving forces of high-end home systems that contain the latest hardware and processor enhancements. It is imperative that students have access to these types of machines for their gaming projects. LARC's reputation and Dr. Parberry's excellent business networking skill have allowed the lab to receive valuable donations from various companies. Businesses are willing to donate, because LARC's focus is of interest to the industry and gives students hands-on and real world education.

3. ISSA (NATIONAL)

"The Information Systems Security Association (ISSA) is a not-for-profit, international organization of information security professionals and practitioners. It provides educational forums, publications and peer interaction opportunities that enhance the knowledge, skill and professional growth of its members."

ISSA provides a forum for professionals to discuss the latest in network security and to network with other professionals from organizations of all sizes. ISSA also provides custom training and events for its members. Topics related to all aspects of computer security are covered and members range from very technical practitioners to managers and educators.

4. ISSA AT UTSA

In the fall of 2004, IS and Computer Science students at the University of Texas at San Antonio (UTSA) created a student chapter of ISSA. The main purpose of ISSA at UTSA was to provide a multi-disciplinary organization whose sole focus was cyber security. There were a number of advantages given to UTSA students to encourage them to join the local ISSA club. These are discussed below.

4.1 Student Benefits for ISSA at UTSA

4.1.1 The Ability to Join ISSA at a Rate Offeset by the Local Club

Twenty students were allowed to join the ISSA chapter for $30 dollars per year. The local club offset the price of the club dues, making it easier for low income college students to join.

4.1.2 The Ability to Hear ISSA Speakers at Student Meetings

The local ISSA club would provide a speaker once a month for one of the student chapter meetings.

4.1.3 The Ability to Network with ISSA Members for Internship and Job Positions

Students were encouraged to attend the regular ISSA meetings and were recognized as students. The local club was very enthusiastic about the students and encouraged members and students to talk after the meeting. As a result, two ISSA student members were able to land internship positions with a local computer security company.

4.1.4 The Opportunity to be on the Competing Team for the Southwest Regional Collegiate Cyber Defense Competition (CCDC)

This year, the first Southwest Regional Collegiate Cyber Defense Competition (CCDC) was held at UTSA. This competition was designed to test the students' ability to secure and maintain a network in an operational business environment. Members of the competing team had to be ISSA at UTSA members.

4.2 Formation of ISSA at UTSA

The ISSA organization at UTSA was formed as a Registered Student Organization (RSO) according to the rules set forth by the University. In order to form a RSO, a Faculty Advisor was required in addition to five student officers.

The structure chosen by the student was a single president with a number of subordinate officer positions. In the end, there was a President, Vice President, Treasurer, Publicity, and Secretary. Duties were split amongst the officers and included planning events, tracking finances, and meeting regularly with the local ISSA chapter. We were lucky to have a faculty member in mind who was willing to support the organization. Dr. Greg White was a local ISSA board member, an IA professor with industry experience, and was willing to provide time and guidance to the group.

4.3 Lessons Learned and Advice for Starting an ISSA Student Chapter

There were a number of lessons learned from the experience of creating a student chapter and there are things that ISSA at UTSA has already started to consider in order to improve the quality of the organization.

Although the ISSA at UTSA organization was very successful at obtaining professional speakers and holding meetings, the organization did not follow through on any projects meant to enhance the group's campus and community image and give hands on practice in security practices.

Our faculty sponsor was very helpful at providing ideas for the organization but in the future the sponsor needs to be more involved in by giving more defined goals and guidance to the students. We would suggest to any group attempting to create a chapter that the faculty advisor and the officers decide clear semester goals and projects. It is also necessary that the faculty advisor have a good relationship with the local ISSA parent chapter.

Funding was a problem for this organization. As a RSO, funds have to be obtained through student government, from club dues, or from donations. The issue of equipment is a difficult one to address, and space for equipment was a concern at UTSA. In the future, the UTSA group plans to address financing in the following ways:

- Presenting a proposed to student government early in semester
- Increasing recruitment efforts to bring in club dues
- Working with ISSA members' companies to sponsor food at meetings and possibly equipment donations.

There is also the possibility of charging for computer repair services to other student or offering services such as spyware removal for a small fee that goes to club activities. The club may consider more traditional fundraisers as well.

The club plans to increase recruiting for the year by ensuring that a schedule is available to students at the beginning of the fall semester. The club also plans to speak to as many security classes as they can. The club will also be sponsoring some social events in addition to the ISSA speakers.

The main advice for anyone wanting to establish an ISSA student chapter at their institution would be to start early, work closely with the local ISSA chapter, ensure that a solid vision and goals are established early in the semester, and make a good budget.

5. A NEW MODEL

While both the LARC and the ISSA are steps in the right direction, we believe that by mixing ideas from both organizations a new kind of student organization could be created that would provide a forum for students to learn and practice their skills in a laboratory environment in addition to being able to network with professionals in industry and eventually test their skills in various community service projects.

We believe that the model should consist of the following areas:

1. A laboratory environment, closed to the rest of the world that would allow specialized configurations and testing of security tools and methodology.
2. A faculty member dedicated to keeping the group on track through directing research and results. The faculty member should also be in tune with the local security environment and have connections to various professional and non-profit organizations in order to shape the group. The faculty member should also have the ability to assign course credit for independent research projects.
3. Each semester a particular research area should be chosen. All speakers and presentations for the semester should focus on the research area. At the end of the semester, the students as a group should have created a deliverable, whether a checklist, white paper, or documentation that shows a thorough understanding of the topic.
4. By the end of the semester the student group should have the ability to perform some form of community service to the campus, a non-profit organization, or company based on the research area for the semester. For example, if the topic for the semester is to secure Virtual Private Networks (VPNs), a suitable organization should be located to allow students a chance to deploy and secure some VPNs.

5.1 Laboratory Environment

It is imperative that students have a well-stocked security laboratory to work in. The laboratory environment should be separate from the outside Internet, but a connection to the Internet must be available. There should be a variety of machines with numerous different operating systems to allow students to configure and practice on a wide variety of machines.

Most school budgets are continually being cut, and so funding for such a laboratory might be sparse. Students should be encouraged to solicit monetary donations or equipment from companies in order to build the lab. Unfortunately, proper security education will be difficult without a wide variety of equipment.

5.2 Faculty Involvement

The level of faculty involvement will determine a large measure of success for this group. A dedicated professor is required for a number of reasons. Academic, research, industry contacts, and a host of other tasks are required for the group to be successful.

Students need direction. They need a professor to keep them on track. In the LARC model, the group is allowed to take independent studies courses with the professor. A faculty member is required to choose the research topic for the semester and to act as the figure in charge at the University level.

Students will benefit by having a faculty member providing focus. As the semester progresses, students will benefit greatly by having their tasks and their schedule tracked.

Students and the lead faculty should retain root level access to all the machines in the lab and be allowed (or assigned) various tasks to configure the lab and keep it working properly. The more hands on assignments that can be given, the more students will learn.

5.3 Research Areas

The research area for the semester needs to be carefully chosen by the professor. The area should be broad enough to allow study for the entire semester, yet should be focused enough that there is a definite start and end.

The research area should pertain to an area of security that is practical to most organizations. The research topic should allow

students to create a deliverable at the end of the semester, whether it's a checklist or a best practices guide.

Guest speakers should be brought in during the semester who are subject matter experts in the area chosen. These could be academic or industry professionals, but they should clearly be experts in their area.

5.4 Deliverables
The students should have a tangible deliverable due at the end of a semester. The deliverable could be a checklist, white paper, or best practices guide, but it should be a quantifiable deliverable that students complete as a team.

There are a number of advantages to this approach. First, the students have a real deliverable that they can put on their resumes. Second, this deliverable to be taken to companies to convince them of the students expertise in order to allow students to work on their systems. Third, students and the group can gain credibility by sharing these deliverables on their website and with other security professionals (such as ISSA).

5.5 Some Sample Research Areas
There are a virtually unlimited number of research areas and possible deliverables for a class to perform. The following are just some examples.

5.5.1 Security Audits
Security audits are increasingly important in today's security climate. Audits can provide a snapshot of a company's security posture and can expose many internal problems before an outsider does.

There are many pieces to a security audit, and students could spend a whole semester or even several semesters focusing on the methodology behind auditing different pieces of equipment. In the end, students should be able to produce a security checklist. That checklist should then be verified against a live organization and the results presented to that organization.

5.5.2 IDS and Firewalls
Modern day Intrusion Detection Systems (IDS) and Firewalls are very complicated and many organizations do not have properly set up devices. Students could spend a full semester learning about the various types of firewalls and IDSs and create a checklist/test script to test for common mistakes in setup.

5.6 Campus Activities and Other Projects
Additionally, there a number of service opportunities that can be implemented at individual college campuses and directed towards the student body at large. These could include:

- Laptop cleaning and spyware removal
- Securing Wireless access
- Computer Security Awareness
- Campus/Student lab audits

Permission and cooperation from the University's Information Technology department would be required for certain projects, but hopefully the university staff would appreciate the educational value that these projects could provide to students.

6. Conclusion
Computer security is a rapidly growing field and many universities are stepping up their curriculums to meet the challenge. Unfortunately for most students, there is a gap between the academic curriculum and the practical knowledge necessary to perform meaningful work in the security arena. We believe that the creation of cyber security student organizations is one of the ways that campuses can give students the necessary hands on experience to be successful. However, it is important that these organizations have a strong focus and give students the proper resources to truly learn their craft.

7. REFERENCES
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