Developing and Sustaining Information Assurance:

The Role of Community Colleges (Part 1)

n 2001, articles in several technology journals under-scored the shortage of qualified security professionals who understood information assurance (IA) concepts. At the time, only a handful of universities offered academic programs in IA, and those were at the masters and doctoral levels.

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Although a few colleges had classes that covered IA topics, no under-graduate-level programs existed.

Continual training and education are necessary to manage the ever-evolving technologies of computer systems and network administration, which place increasingly heavy demands on public and private entities. New positions open frequently for qualified applicants in IA, sometimes forcing existing employees to step into the job of maintaining secure and available computer infrastructures to support their organizations.

To help address the ongoing need for security training, several US community colleges have stepped up to develop academic programs over the past several years.[1,2] This article presents the case for IA training at that level, setting the stage for further examination of the particular challenges that it entails.

Situation analysis and motivation

The US National Information Systems Security (Infosec) Glossary says that IA encompasses those "measures that protect and defend information and information sys-tems by ensuring their availability, integrity, authentication, confidentiality, and nonrepudiation. These measures include providing for restoration of information systems by incorporating protection, detection, and reaction capabilities."[3]

IA issues are prevalent in businesses and government agencies throughout the world, but enterprises often misunderstand and completely neglect them. This is particularly true for small businesses, but it applies to large industries and agencies as well. The terrorist attacks of September 11, 2001 made it clear that all IT personnel in every business, especially staff that support the chief information officer, need a thorough understanding of IA issues.

More recently, hurricane Katrina significantly impacted the IT operations and data centers of many public agencies and education enterprises in Louisiana and the surrounding areas. These organizations require extensive IA training to ensure that IT personnel know how to protect and preserve vital data and information, and that plans are in place for disaster recovery and preparedness. Law enforcement data on increases in identify theft also point to the critical need to prepare individuals in a wide range of organizations to assure that information and technical operations supporting vital information are protected.

The 15 May 2002 issue of *CIO Magazine* argued that:

> Companies that want to manage security in-house need full-time security people organized into a team, carrying out a coherent security program that sets specific responsibilities and policies. Unfortunately, talent is extremely scarce. To increase their chances of hiring good security people, companies should consider using specialized recruiters, tapping the military and universities as good sources for candidates, and recruiting from the security companies they are working with. Failing that, CIOs can retrain existing IT staff, using consultants or vendors as trainers, and send staff to certification and internship programs.[4]

IA is a critical requirement for everyone who processes or deals with information in any form. Many people who work in information management positions have little knowledge of IA beyond the basic concepts, however, and few are trained in its use. This presents a problem for employers who must train them.

Community colleges and IA

Traditionally, community colleges have been viewed as integral parts of their surrounding communities. They provide affordable entry to higher education. In fact, many students are the first in their families to attend college. The typical student isn't fresh out of high school—indeed, the average community college student is 29 years old. The American Association of Community Colleges' demographic portrait[5] further shows that:

- 46 percent of US undergraduates attend community colleges,
- 45 percent of first-time freshmen are at community colleges, and
- 62 percent of community college students attend part time.

The study further shows that community colleges enroll a significant proportion of students from ethnic minorities:

- 47 percent of African-American undergraduates attend community colleges,
- 56 percent of Hispanic undergraduates attend community colleges, and
- 57 percent of Native American undergraduates attend community college.

The presence of IA programs at community colleges can thus help prepare minority students for technical careers, and could play a critical role in reversing the significant underrepresentation of minorities in the IT industry as a whole.

Most community colleges have local and state mandates to prepare workers for 21st-century jobs. They have an extensive, well-established presence in workforce initiatives, frequently providing one-stop workforce connections and extensive involvement in IT education and certification programs. This is exemplified by ongoing affiliations with organizations such as Microsoft IT Academies, Cisco Networking Academies, Oracle Academic Initiatives, and Computing Technology Industry Association, which provides member partnerships in CompTIA standards development and apprenticeship programs such as the US National Information Technology Apprenticeship System.

Given their prominent role in such initiatives, community colleges are a natural fit for helping develop an IA-knowledgeable workforce. The US National Security Agency's Information Assurance Courseware Evaluation (IACE) program recognized nine community colleges in 2005 for meeting the Committee on National Security Systems' curriculum standards. In recent years, community colleges have been in the forefront of educating those who protect the nation's critical infrastructure—network technicians and administrators who are the first responders to IT emergencies and incidents.

By retraining the IT workforce, community colleges significantly extend and broaden the skill sets of incumbent workers and professionals. Community college programs greatly help build capacity by increasing the number of academically trained professionals in the security area, and 96 percent of those in business and industry who hire from community college programs recommend them.[5] Community college students represent a largely untapped resource of qualified citizens eligible for service in federal agencies and in industry.

Awareness of IA programs offered at community colleges is growing among industry, government agencies, and higher-education institutions. Community colleges provide a natural pipeline for IA graduates transitioning to four-year institutions, and partnerships with universities, businesses, and government agencies should influence and inform community college curricula to build an IA workforce.

Gaining ground

Over the past several years, we've seen a significant increase in community college attendees at security-related conferences and colloquia. Information security has assumed a central role at community college national conferences, such as the League for Innovation and the American Association of Community Colleges. The creation of funding specifically for community college programs, under the US National Science Foundation (NSF) Advanced Technology Education (ATE) program, has enabled numerous community colleges to obtain funding for Internet security, IA, and network security programs. Moreover, community colleges implementing IA programs have committed significant resources for faculties' professional growth through funding for industry-certification programs and partnerships with industry-sponsored IA educational programs.

Community college education and training programs in IA present affordable alternatives to universities and private institutions. They

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tend to focus on applied (rather than theoretical or research) skills and are generally flexible enough to adapt to changing requirements

they're in a unique position to expand the literacy in IA and security as core skills for IT coursework. Community colleges can also pre-

tecting Information: The Role of Community Colleges in Cybersecurity Education, Community College Press, 2002.

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and the evolution of information technologies. Preparing researchers in IA is critical to furthering the discipline, but many employers require practical preparation based on hands-on learning experiences, specific to current job requirements and validated by industry-recognized certification. Community colleges have attended to this need by creating multiple education and training programs tied to industry standards and certifications. Popular examples include programs that prepare Web developers, programmers, and network administrators, most of which are aligned with recognized industry-certification requirements in some form.

IA programs at community colleges have evolved from these experiences, building on lessons learned and improved offerings. Given community colleges' demonstrated ability to fast-track the education and training process through flexible, year-round, and creative program schedules and delivery methods, they are well-suited to helping solve the immediate need for IA-skilled workforce. These programs can quickly build capacity and capabilities among teaching staff, curriculum, and delivery services, and they provide cost-effective services and programs for new entrants and those reentering the workforce.

Community colleges can play a key role in the IA domain by incorporating security as a core skill for IT coursework and developing IA curricula for specialists. In fact,

pare IT technicians for work in areas such as network and infrastructure support services, database and software application development, end-user support, software help desks, and software testing.

The next installment in this article series will focus on how two schools—Mesa Community College, in Arizona, and Norwalk Community College, in Connecticut—have faced some of the challenges of establishing an IA curriculum. The two adopted similar development approaches, but enough differences exist between them to make interesting comparisons. In particular, we'll look at how they've faced sustainability issues, and how they relied heavily on input from business and industry during the curriculum-development process, primarily drawing working with this community of experts through vibrant industry advisory boards, to develop degree programs. □

References

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