Software Licensure 2012

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The Path to Licensure

Software engineers will soon be able to earn a PE license, thanks to the work of NSPE and other groups.

BY DANIELLE BOYKIN

Airplanes, banking systems, cars, electrical grids, medical equipment, and nuclear reactors all contain vital software systems. A failure of these systems could produce harmful and widespread consequences for the public. Five years ago, an alliance of engineering organizations believed that the critical nature of some engineered software systems to the public health, safety, and welfare clearly indicated that the time was right to move the software engineering field onto the path to licensure.

In April 2013, the National Council of Examiners for Engineering and Surveying will begin offering annually a PE exam in software engineering—the first new exam developed in a decade. The exam tests the knowledge and skills of engineers who have experience with software applications that directly affect the public in areas such as transportation, power generation, and medical systems.

Since 2007, the Software Engineering Consortium has spread the word about the importance of software engineering licensure. Now that the course to licensure is a reality, this alliance is embarking on an outreach campaign to promote licensure to practicing and aspiring engineers.

NCEES partnered with IEEE-USA (the lead technical society) and was assisted by the IEEE Computer Society, NSPE, and the Texas Board of Professional Engineers to develop the exam. NCEES approved plans for the exam in 2009 after it received letters of support from 10 licensing boards, a prerequisite to implementing a new exam. Alabama, Delaware, Florida, Michigan, Missouri, New Mexico, New York, North Carolina, Texas, and Virginia are states that are home to high-tech industries and have colleges with ABET-accredited software engineering programs. The IEEE Computer Society conducted a survey in 2009 that revealed that two-thirds of those software engineers employed in the industry support a licensure exam for their profession.

A Real Path

Creating the PE exam for the software engineering discipline was the first critical step to

knocking down barriers to licensure. The next phase will involve communicating the value of licensure for software engineers, says TBPE Executive Director Lance Kinney, P.E. "Individuals performing software engineering never realized a need for it and didn't see a route for it. They were able to say, 'This doesn't apply to me,'" he says. "Now it can apply to them. They have a real path now."

A software engineering practice standards guide was introduced to the boards during the recent NCEES annual meeting to assist them with determining if their jurisdiction should license engineers in this discipline. The guide advises boards that if the failure of a software system presents a significant risk to life, health, or property then the development of the software falls under the definition of the practice of engineering and should be performed by a licensed engineer with software knowledge. Engineers working for government entities and large firms may be exempt depending on their state law, particularly if they are being supervised by a licensed engineer. Jurisdictions may require licensure of engineers who are sole practitioners offering services directly to the public or who work for a limited liability corporation.

A Unified Vision

Texas has led the way in software engineering licensure. In 1998, the state became the first to license software engineers through an experience-only path and remains the only U.S. jurisdiction to provide this license. Donald Bagert, P.E., became the first person in the U.S. to receive licensure as a software engineer. The TBPE ended the experience-only path to engineering licensure in 2006, which hampered the licensure of software engineers because there was no PE exam for the discipline.

Kinney believes having the right people at the table from day one is what led to the consortium's success. "We had a unified vision from the start," he says. "There were concerns, but we figured out what the hurdles to licensure were. We looked at them only as hurdles and not as issues to stop our progress."

Through the years, NSPE presidents and members of NSPE's Professional Engineers in Industry (PEI) have played critical roles in support of creating a path to licensure for software engineers. NSPE President Dan Wittliff, P.E., says the consortium provides a good model for what can happen when professional engineers unite on a critical licensure issue. "It is in the best interest of the engineering profession and the public to have licensed practitioners who are involved in software development," says Wittliff, who served as the consortium's facilitator.

Wittliff is hopeful that some of the licensing boards that supported the creation of an exam will soon join Texas in offering the exam. "It's my opinion that these states are going to be the leaders in putting the changes necessary into their state laws to have software engineers licensed," he says.

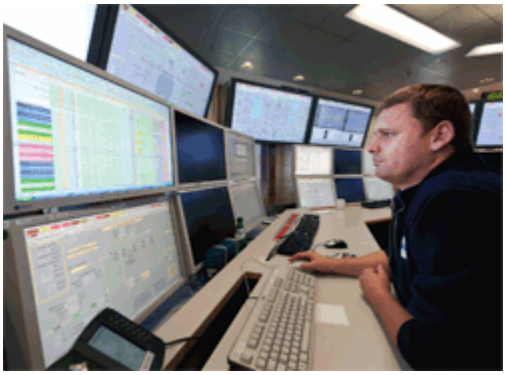
Mitch Thornton, P.E, believes that an important component of the consortium's outreach campaign will be to clarify the definition of a software engineer and to explain how it differs from, for example, computer engineering. He says that the alliance remains the best vehicle for this campaign. "One of the things that made our exam development

journey a successful undertaking is that support was provided by the collection of societies instead of a single professional organization," says Thornton, the vice chair of the IEEE-USA Licensure and Registration Committee.

Frank Fong, P.E., who serves on the consortium's exam development committee, says members of the coalition would like most software engineers to pursue licensure. However, the consortium made it very clear from the beginning that it would not dictate to unregulated companies that their software engineers must be licensed. The consortium, he says, should work with these firms to help them understand the importance of licensure. "Companies that are involved in developing games don't need to have licensed software engineers, but a utility company that uses software in their products should have their software engineers licensed," says Fong, a member of the PEI executive board. "We want engineers who can affect the health, safety, and welfare of the public to be licensed."

A Badge of Honor

Phillip Laplante, P.E, chair of the consortium's exam development committee, is satisfied that the software engineering graduate students he teaches will have a more complete path to licensure. Licensure, he tells them, can help engineers to distinguish themselves from their colleagues. "It's a badge of honor and a significant indication of accomplishment," says the professor of software engineering at Pennsylvania State University's School of Graduate Professional Studies. "Everyone I know that has passed the PE exam is proud of that."



In a world where software controls systems that can have a direct impact on the public health and safety, NSPE and other groups said the time was right to create a path to licensure for software engineers. Here an employee monitors data at a gas-fired power station in Germany.

Laplante didn't take a traditional route to practicing software engineering because there were few accredited degree programs in the discipline when he attended college. Armed with a bachelor's degree in systems planning and management and advanced degrees in electrical engineering and computer science, he obtained a PE license even though industry doesn't require it. He knows that licensure can open up career opportunities for engineering professionals. "The positions that I had prior to becoming a professor were unlocked for me because I was licensed," says Laplante. "Licensure wasn't a required credential, but it was a preferred credential. I believe this brought my resume up to the top of the pile."

As an educator, Thornton believes it's his duty to counsel his students on the importance of licensure to their careers, the profession, and the public. He encourages them to start down this road by taking the FE exam prior to graduation. "We need to encourage engineering educators to discuss licensure with their students, whether they personally agree with it or not," says the professor of computer science and electrical engineering at

Southern Methodist University's School of Engineering in Dallas. "I think it's a disservice to students not to inform them about licensure."

Fong understands the strong influence that engineering deans and faculty members can have on students when it comes to promoting licensure. "I received motivation for getting licensed from my engineering dean," he recalls. "He encouraged us, and often stated, 'You're not a professional until you're licensed.'"

Fong has worked in the aerospace industry during most of his career and currently evaluates software for satellite systems. Aerospace employment is cyclical, and the PE license has served as a type of "insurance policy," he says. "Licensure gave me more options, and my involvement with NSPE and the California Society of Professional Engineers has allowed me to broaden my professional network outside of the aerospace industry," says Fong, who has an electrical engineering background.

Myths and Fears

Throughout the process of developing a software engineering exam, Laplante has heard from skeptics of engineering licensure. These engineers question the need for licensure because the systems they designed haven't failed during the course of their careers. He advises them to imagine the same argument applied to the medical profession. "I tell them to
pretend that we're talking about medical licensure and an individual has been treating patients without a license for 25 years and no one has died," he says. "Does that mean we shouldn't have licensure of medical professionals?" This comparison, he says, usually chips away at their argument.

Promoting licensure will require dispelling the myths and fears that students and engineers in the field may have about pursuing licensure. These myths and fears, Laplante says, involve individuals believing that if software engineering licensure is implemented throughout the nation, they will automatically lose a job if they aren't licensed or will not be able call themselves software engineers. Others doubt that they can get licensed because they became a software engineer through a nontraditional path. "We have to encourage people that this is not going to steal their livelihoods and will elevate software engineering to a level of professionalism that it always wished it could enjoy," he says.

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IEEE-USA Offers Study Guide for Software Engineering

Licensure Exam

BY PHIL LAPLANTE, CSDP, P.E., PH.D., IEEE FELLOW, CHAIR, SOFTWARE ENGINEERING PE EXAM DEVELOPMENT COMMITTEE

After several years of planning, consensus building, research and development and many hundreds of hours of work by dedicated volunteer engineers, the path for licensure of software engineers in the United States is now a reality. The last step in the path, the Principles & Practice of Software Engineering Examination (also known as the "Software PE Exam"), was recently completed and will be offered in at least 10 states in April 2013. IEEE-USA is offering an exam preparation guide to help individuals prepare for the exam. This article provides important background information on this exam.

Development of the Exam

The process that has led to the development of the exam began several years ago when the IEEE-USA Licensure and Registration Committee (LRC) surveyed IEEE membership to determine if there was a perceived need for licensure of software engineers working on software systems that affect the "health, safety and welfare" of the public. The result of the survey indicated that such a need existed. Next, the LRC, in conjunction with the IEEE Computer Society, the National Society of Professional Engineers (NSPE), the Texas Board of Professional Engineers, and the National Council for Examiners of Engineers and Surveyors (NCEES) began exploring states' interest in licensing software engineers. When the licensure boards of 10 states, Alabama, Delaware, Florida, Michigan, Missouri, New Mexico, New York, North Carolina, Texas, and Virginia, agreed to make the exam available, the NCEES began the exam development process.

An exam development committee of more than 30 PEs working in software critical systems was formed. All are licensed in one or more states in electrical, computer or another engineering discipline or in software engineering from Texas, which had licensed a number of software engineers by portfolio examination several years ago. Most

members of the committee have 20 or more years' experience specifying, building or testing software in such critical industries as power generation and distribution, transportation, and avionics.

The committee designed and conducted a Professional Activity and Knowledge Skill Study (PAKS) of IEEE and NSPE members. The detailed analysis of more than 300 responses resulted in an exam specification, that is, a body of knowledge specifically pertaining to critical software. The specification lists requisite knowledge in requirements engineering, design, construction, testing, quality assurance, maintenance and more and stipulates the proportion of questions to be expected in each area. This document can be found at www.ncees.org.

After developing the exam specification, the committee spent two years writing and reviewing exam questions. The rigorous review and post test results analysis process is designed to insure that all exam items are reliable and valid. The P&P test is a one day, multiple choice exam consisting of 80 questions taken during two four hour sessions. In order to have sufficient diversity of questions and backup items and to produce the sample exam, more than 200 questions needed to be written and reviewed.

Licensure Requirements and Process

Only software professionals working on software that can affect health, safety and welfare, and who are offering their services directly to the public (and not through a corporate or government entity, which may be exempted) will need to be licensed in those states that require it. How many engineers will be affected, is unknown, but it is likely that it will be a very small number, say <2-5% of software professionals.

As with the other engineering disciplines, the requirements consist of earning an ABET accredited bachelor's degree in Software Engineering, passing the Fundamentals of Engineering Exam, having at least four years of demonstrably relevant experience, and passing the Software PE Exam.

Overcoming Challenges

Some professionals working on critical software do not have undergraduate degrees in Software Engineering, but have degrees in related disciplines such as Computer Science or Computer Engineering. These professionals may still have a path to licensure — most states will recognize a closely related degree if additional years of relevant experience are evidenced. Often, graduate education in software engineering can be counted towards the additional experience and has the benefit of helping to prepare for the Software PE Exam. It is important to note that the exam is designed to test minimum competency, not expertise. The exam is not to act as a barrier to practice, but rather, to insure that professionals conduct their practice so that the safety of the public is protected.

For many software professionals though, the most daunting obstacle to licensure is the Fundamentals of Engineering (FE) Examination. This full day examination covers a broad range of topics that all engineers are expected to know such as mathematics, chemistry, physics, computers, economics and ethics. Review courses and diligent study, however, can help candidates pass the FE exam, whatever their background.

Sample Exam Book

To help prospective examinees to prepare, the exam committee also created a study guide. The guide includes the test specification, 40 representative questions with solutions and a suggested reference list. All code used in the questions are in a generic, pseudo-language, and the description of this language is also included in the book. The exam preparation book is available from the IEEE-USA E-Book catalog. The IEEE member price is $39.99 and the non-member price is $49.99.

Being a licensed professional software engineer is an important credential, and even if not required for the work you do, can distinguish you from other professionals and unlock job

opportunities. If you think you might need to become licensed or would like to become licensed as a software engineer, start by checking with your state board of professional licensure for eligibility and requirements. You may also check the following for more information:

- www.todaysengineer.org/2011/Jul/licensure.asp
- www.todaysengineer.org/2011/Jan/licensure.asp
- www.ncees.org

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Comments may be submitted to todaysengineer@ieee