IEEE Standards Education e-Magazine

The IEEE Standards Education e-Magazine A publication for those who learn, teach, use, deploy, develop and enjoy Standards! Sponsored by the Standards Education Committee IEEE is committed to: promoting the importance of standards in meeting technical, economic, environmental, and societal challenges; disseminating learning materials on the application of standards in the design and development aspects of educational programs; actively promoting the integration of standards into academic programs; providing short courses about standards needed in the design and development phases of professional practice. Serving the community of students, educators, practitioners, developers and standards users, we are building a community of standards education for the benefit of humanity. Join us as we explore the three fundamental dynamics of standards--technology, economics and politics, and enjoy our feature articles about the use, deployment, implementation and creation of technical standards.

The IEEE Standards Education e-Magazine

Third Quarter 2011, Vol. 1, No. 1

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Welcome to the IEEE Standards Education e-Magazine

A publication for those who learn, teach, use, deploy, develop and enjoy Standards!

IEEE is committed to:

- promoting the importance of standards in meeting technical, economic, environmental, and societal challenges;
- disseminating learning materials on the application of standards in the design and development aspects of educational programs;
- actively promoting the integration of standards into academic programs;
- providing short courses about standards needed in the design and development phases of professional practice.

Serving the community of students, educators, practitioners, developers and standards users, we are building a community of standards education for the benefit of humanity.

Learn more about the three fundamental dynamics of standards--technology, economics and politics, and enjoy our feature articles about the use, deployment, implementation and creation of technical standards.

What are Standards?

Technical standards are formal documents that establish uniform engineering or technical criteria, methods, processes and practices developed through an accredited consensus process.

Standards are:

- developed based on guiding principles of openness, balance, consensus, and due process;
- established in order to meet technical, safety, regulatory, societal and market needs;
- catalysts for technological innovation and global market competition.

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Letter from the Editor-in-Chief

Yatin Trivedi

Welcome!

All inaugural events are exciting – be it the Presidential Inauguration, the unveiling of a piece of art or the launching of a new product – and the inaugural issue of this e-magazine is no exception. The Editorial Board as well as the members of IEEE Standards Education Committee (SEC) are truly very excited to bring the inaugural issue of the IEEE Standards Education eZine to you.

We are launching the *IEEE Standards Education eZine* to keep information in front of those who are interested in education about standards. If you think creating/developing standards is an arduous process, think about those who do so many other things with the standards. Having a published standard is just the first step. It has to be used by the practitioners to really become a standard beyond the book. It needs to be taught to students, needs to be designed into products, tested for compliance, and celebrated for wide adoption and deployment. There are experiences that each of us encounter on our path to interacting with many standards in our daily routine. We need to share those. So, think of the *IEEE Standards Education eZine* as a quarterly publication for those who learn, teach, develop, deploy, use and enjoy Standards.

The topics we intend to address include challenges and opportunities for teaching about standards in engineering curriculum. Of course, education does not end with colleges or universities. Continuing Education is an important part of our learning experience. We will invite various educators and practitioners to share their experiences and views on standards and their applications. Though we may focus on and use examples from various IEEE standards, you can apply the same information for other standards such as those from ANSI, IEC or any of the national standards.

Do you know about Student Application Projects, affectionately known as Student Grants, sponsored by SEC? So far, we have funded 50 projects, $500 for students and $300 for a faculty who mentors them. We expect to have some of these students and faculty members share their experiences in working on those projects with all of you.

Are we going to have some fun topics? You bet, and we are sure you will enjoy the humor; but we will leave it as a mystery for now.

You will notice that the *IEEE Standards Education eZine* is unique in its approach to bring timely information. As a format, it is neither a print-format magazine, nor a periodical that appears all-at-once whether on-line or in print. It is a not a blog by one person (who, me?), nor is it an exclusive compendium of scholarly articles. We intend to have regular columns, expert views, worthwhile standards experiences from different regions of the world and information about various conferences, seminars and workshops that the SEC sponsors and participates in. Over time, you will see the *IEEE Standards Education eZine* served in many of these forms, though printing will have to be at your end. We intend to remain Green Forever!

What meets the eye as a launch is just the external or public view of an instance in time. In reality, the activity has been taking place in the background for quite some time, and many people have worked on it to bring it to reality. Special thanks to Jennifer McClain, David Law, Steve Mills, and the members of the SEC for their contribution, guidance and inspiration.

I am excited to be working on this publication. I hope you will read, learn, enjoy and provide us feedback so we can continue to improve. After all, life is all about one continuous learning experience!

With that, the Editorial Board inaugurates the *IEEE Standards Education eZine*. Enjoy!

- Yatin Trivedi

The IEEE Standards Education eZine Editorial Board welcomes your comments and suggestions. Please write to us at: ezine-eb@listserv.ieee.org.

About the Editor-in-Chief

Yatin Trivedi is Director of Standards and Interoperability Programs at Synopsys. He is a member of the IEEE Standards Education Committee (SEC), represents Synopsys on the Board of Directors of the IEEE-ISTO and at the Board of Directors of Accellera. He represents Synopsys on several standards committees and manages interoperability initiatives under the corporate strategic marketing group. He also works closely with the Synopsys University program.

Prior to joining Synopsys, Yatin was Senior Director of Strategic Partnership Programs at Magma Design Automation. He worked with Semiconductor IP and Library suppliers, and EDA tools vendors to establish comprehensive supply chain solutions around Magma's digital design implementation and analysis flows.

In 1992, Yatin co-founded Seva Technologies as one of the early Design Services companies in Silicon Valley. He co-authored the first book on Verilog HDL in 1990 and was the Editor of IEEE Std 1364-1995TM and IEEE Std 1364-2001TM. He also started, managed and taught courses in VLSI Design Engineering curriculum at UC Santa Cruz extension (1990-2001). Yatin started his career at AMD and also worked at Sun Microsystems.

Yatin received his B.E. (Hons) EEE from BITS, Pilani and M.S. Computer Engineering from Case Western Reserve University, Cleveland.

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Feature articles in this issue

3.1 Importance of Standards Video: IEEE Standards Association President, Steve Mills, discusses the importance of standards to industry and why practitioners and university students should care about standards.

3.2 Why Standards Matter: Wael Diab, Senior Technical Director, Broadcom's Office of CTO, highlights the vital role standards play in industry by providing a foundation over which innovation can happen.

3.3 Global University Outreach: Susan Tatiner, Director of Government Relations & Standards Education for the IEEE Standards Association, provides details on knowledge gained from outreach to 17 universities to better understand what would be useful to universities for introducing the importance of standards into the engineering course curriculum.

3.4 Incorporating Standards Education in University Curriculum: Dr. Amin Karim, Vice-Chair of the Standards Education Committee, outlines the importance of teaching standards in the classroom and offers ways to achieve this in an already crowded curriculum.

Importance of Standards

In the first of a three-part interview, Steve Mills, President of the IEEE Standards Association sits down with IEEE Standards Education e-Magazine Editor-in-Chief Yatin Trivedi to discuss the importance of standards to industry and why practitioners and university students should care about standards.

Part one in a three part series (5:53)

Video will launch in You Tube

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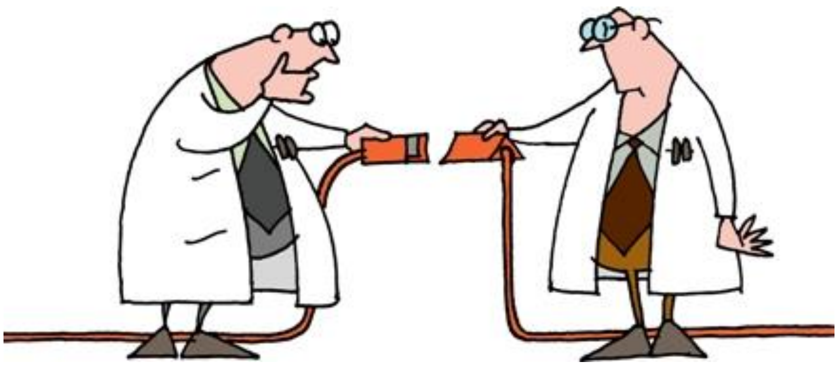
Why Standards Matter

by Wael William Diab

September 2011



It is virtually impossible to look around and not see the hand that standards play in our daily life. As our lifestyle increases in pace the ability to have different pieces of technology talk to each other becomes of increasing importance. Nevertheless, there is more to it than that and in order to understand why standards are important in an educational context it would make sense to first take a look at what role they play in bringing technology to market.

The Role of Standards in the Industry

Technology today evolves at record pace. In the Information and Communications Technology (ICT) space we are moving in leaps and bounds seeing evolution everywhere from the hand to the home to the office and underlying infrastructure. This revolution is global in scope and diverse in breadth, at the heart of which is innovation. Much goes into the evolutionary process and standards play a key role by providing a foundation over which the innovation can happen.

A closer look at what goes into an ICT device shows a complex set of intertwined technologies. Unlike the landscape of decades past, the ecosystem today is distinctly different. A communication device incorporates a host of technologies from the lower level hardware communication protocols to the application layer software and applications (or applets). Storage, location, security, privacy, compute power, international interfaces, mobility, cost and the energy footprint are examples of some of the components that need to be considered or incorporated into the device. So how can standards help with this? Let's take a look at the five pillars that standards provide:

1) **Interoperability**: First and foremost standards allow for interoperability, which for a communication device is crucial. It means that it can "talk" to a neighboring device without

knowing who manufactures the other device and/or its properties. This is tremendously important to industry especially as the complexity of devices grow for two reasons:

a. Bigger pie: The interoperability allows for the overall pie or market to be larger both directly by providing a standard way to interoperate so there is less variation and indirectly by consolidating what would otherwise be variation into a single variant and thus driving volumes.

b. Focus: Because the complexity of a particular device is quite large, providing a standard for the interoperability portion means that a company can focus its R&D dollars in areas it can differentiate. Moreover, industry can benefit from the larger pie / reduced cost above and focus its differentiation on top of the standards enabling an enhanced return on investment (ROI) for companies and products that embrace open standards.

2) **International scope and applicability:** In an increasingly borderless world today, design and use practices of generations past has also changed. Vertical geographical design is no longer the norm. It is being replaced by practices where a device maybe designed in one place and manufactured in a handful of places. Similarly, a device may be sold into a number of geographical markets or taken into different geographies by its increasingly mobile users. Thus it should come as no surprise that standards need to incorporate that and they in fact do by bringing internationally domiciled experts under one roof and producing internationally usable standards, again benefiting their users, reducing their costs, and increasing the standards applicability.

3) **Innovation and research:** A casual reader may have interpreted 1(b) above as standards do not require innovation or research. The first bullet refers to how industry can focus its R&D dollars in a particular product or set of technologies. ICT standards as it turns out draw on a lot of innovation and research from both researchers from industry as well as academia to help solve the problems of how to exchange more types of information in more ways at higher speeds. Like any emerging technology, the process draws on the best minds to address the engineering tradeoffs of the technology underneath the hood of the standard and a successful standards process creates a place for academia and industry to intersect. This brings us to the next pillar: the standardization environment.

4) **Standardization environment:** All of the above would not be possible without an environment that fosters a healthy discussion and a process to write the standard itself. From a framework for bringing intellectual property to balloting (voting) to the procedures and governance to the participants, it takes a lot to develop and market a successful standard.

5) **Ecosystem of standards**: As with the device itself, it is rare to find an ICT device that relies on one standard. It is amazing to look at the number of standards that go into one device, let alone how they interact with each other. Again, the collaboration that occurs between the various Standards Developing Organizations (SDOs) is integral and allows for complex problems to be tackled by sets of people in various expertise domains working on

standards together, a feat that is increasingly harder to accomplish by an individual organization that still meets all of the above.

Bridging the Role of Standards from Industry to Education

If the above pillars hold then it should come as no surprise that understanding standards, keeping up with standards and participating in standards are increasingly more important to organizations. Indeed, as an employee of a major technology innovator and global leader in semiconductors for wired and wireless communications it's not surprising to see that many of the products we put out incorporate multiple standards. Moreover embracing open standards and innovating on top of them in our products means that the work force have to also understand, use, and perhaps contribute to and ultimately embrace standards. From our marketers to our design engineers, standards are now part of the lingo. Products, design specifications and marketing requirement documents frequently reference standards.

The use of standards may vary depending on occupation or level, however, a working knowledge of standards and/or their application and use is more than just a nice to have. Thus, educational curricula, whether for continuing education or for degree based programs including graduate and undergraduate degrees, are better served by integrating standards into them. By way of example, IEEE has published a position paper that defines "the desired role of technical standards in education within engineering, technology, and computing (ETC) academic curricula in the technical areas of interest of IEEE": http://www.ieee.org/education_careers/education/standards/standards_position_paper.html.

As you can see from the above paper the integration into standards can occur at multiple levels and at different depths to "augment the learning experience by pointing students to available design tools, and to best industry practices".

Finally, standards are one of the many ways that aligns the R&D arms of industry and academia on common problems of interest.

Conclusion: Why Standards Are Important

In today's increasingly technology-dependent lifestyle standards have gone beyond the traditional need to meet a particular technical, safety, regulatory, societal, and market need into a catalyst for technological innovation and global market competition.[1] This has affected how industry and academia view standards from a traditional application of technology for a specific interoperability purpose to an integral part of the curriculum to help prepare the work force for the engineering challenges of today. Developing a successful standard is like preparing a gourmet meal. A lot goes into it and the environment in which it is developed is crucial. From the guiding principles of openness, balance, consensus, and due process [1] to the interaction with other SDOs, the standards development organization of today is dynamic in its capability, sophisticated in its ability and wide in its scope of services offering the working professionals and educators the variety they need. The IEEE is an example of such an organization.

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[1] Source: http://www.ieee.org/publications_standards/publications/subscriptions/clientservices/promote/module-8/why.html

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Wael William Diab is currently a Senior Technical Director in Broadcom's Office of the CTO working on technical strategy for the Infrastructure and Networking Group (ING).

Wael is a Senior Member of the IEEE and Vice-Chair of the IEEE 802.3 Ethernet Working Group. He is a member of the IEEE-SA Standards Board, IEEE Standards Education Committee (SEC) and was elected to the IEEE-SA Corporate Advisory Group (CAG). He is a published author, coauthoring Ethernet in the First Mile: Access for Everyone, a book published by the IEEE, and was a contributing author to Broadband Services: Business Models and Technologies for Community Networks.

Wael holds BS and MS degrees in Electrical Engineering from Stanford University, a B.A. degree in Economics from Stanford, and an M.B.A. with honors from the Wharton School of Business. He has 57 issued US patents and has developed over 250 patents-pending in the networking space.

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Lessons from Professors: What the IEEE Learned from Universities Visited

Global University Outreach

by Susan Tatiner, IEEE Standards Association

September 2011

Where do you go when you realize you have a lot to learn? If you are the IEEE Standards Education Committee (SEC)—a highly educated and dedicated group of engineers and educators—you head for the university campuses.

In the autumn of 2010, the SEC asked its University Outreach Ad Hoc committee to determine what would be useful to universities for introducing the importance of standards into the engineering course curriculum. To this end, members of the Ad Hoc and IEEE Standards Association staff visited 17 universities [see sidebar] in China, the U.S., the Middle East, and the U.K. to meet with faculty and administrators for an exchange of views and data gathering about best approaches and materials.

Each University Outreach visit followed a similar format: a short presentation about the IEEE and the SEC, followed by honest dialogue between IEEE attendees and professors around discussion topics such as:

– Are standards and their importance part of the current engineering course curriculum at this institution? If so, at what level, and how are they taught?

– What about the focus of such education? Should it be more technical, or should it include the standards development process, including intellectual property rights (IPR) issues?

Universities Visited

Tsinghua Uiversity (Beijing)

Beijing University of Posts and Telecommunication (Beijing)

Princess Sumaya University for Technology (Amman, Jordan)

Jamia Millia Islamia University (New Delhi)

Delhi Technological University (New Delhi)

India Institute of Science (Bangalore)

Indian Institutes of Information Technology (Bangalore)

University of Strathclyde (Glasgow)

Durham University (Durham, UK)

Kingston University (London)

Imperial College London

Queen Mary University (London)

University of Illinois--Urbana-Champaign (U.S.)

Purdue University (Indiana, U.S.)

DeVry University—North Brunswick (New Jersey, U.S.)

University of California--Irvine (U.S.)

Stanford University (California, U.S.)

– Do you think it is important for students to have an understanding of the industry standards applicable in their fields of interest?

– What tools/materials would be helpful in teaching about industry/technical standards?

The state of standards education at the university level is diverse. Where a school stands on the continuum of delivering practical and analytical education is key to the current inclusion/exclusion of standards in the engineering curriculum, with those schools more focused on the practical application of knowledge being more inclined to already have a standards education component to their programs.

Not surprisingly, there are diverse needs at the undergraduate and graduate levels. Undergrads require a basic level of understanding that standards and standards organizations exist. The students also can use standards immediately at the project level. Graduate students will use standards related to their specific fields of interest, and they can explore the standards development process and the intersection with business interests.

There are differences among countries (short summer courses on standards were suggested in China; certificates, in India) and among universities (there is great diversity of opinion about, and options for, internships, for example).

Amongst all the diversity, there are common themes. For one, educators prefer a distributed model for standards education rather than dedicated courses or programs. For another, employability and industry involvement--bringing the "real world" to the campus—are important.

We found that there are both practical and philosophical obstacles to adding standards to the curriculum. On the practical side, many schools are overwhelmed by the quantity of currently required material. Additionally, some professors don't feel they know enough about standards to teach the subject well—or assess students' work. Finally, even if these obstacles could be overcome, the materials necessary to teach standards education don't yet exist. Philosophically, an obstacle noted was the belief that university education should teach fundamental electrical engineering concepts only. Some question whether standards fit in that construct.

Those who would change standards education must decide the most important things they want to impart about standards. Give students an understanding of the interplay of the three fundamental dynamics of Standards-- Technology, Economics, and Politics. Teach them to think critically about standards development and technology solutions. Explain how standards help drive innovation. … And find ways to add value without adding to the burden of those who teach.

The liveliest part of the University Outreach visits was often the tools and materials discussion. For undergraduates in particular, professors often suggested the value of guest speakers on standards topics during regular semesters. These lectures, live or on video, can be used to give students the basics. Professors can fit them in during the semester as appropriate. For more advanced courses, video interviews with technology experts who work in standards may prove to be an enjoyable way to learn about the work of creating standards and be useful to encourage critical thinking. Other additions to coursework, using the distributed model and finding "bite-sized" ways to include standards education in meaningful ways, was a popular suggestion. Ancillary materials should include assignments and assessment guides.

There is also a place for standards education in courses on the engineering profession, alongside ethics, law, and social responsibility. Industry seminar programs and technology workshops are other possibilities that were discussed. Also included here was the possibility of certificates following a series of seminars. Professors called for the development of case studies that will actually show the intersection of technology, economics, and politics in action. Students love real-world examples, they tell us—the more famous, the more contemporary, the better—and there is always a shortage of good ones.

Competitions were cited as one way to make standards more interesting for students, and the existing IEEE Student Application Project Grant program was given high marks in this same category. An internship program that was a partnership between IEEE, a corporation, and a university is something we should explore. Many professors thought such a program would be popular with students. Finally, professors asked us not to forget about their needs. "Teach me how to teach about standards," one of them said. Such training might include ancillary materials, internships, workshops, mentoring.

In conclusion, there were two strategically important elements that emerged from the IEEE SEC University Outreach effort.

1. A Distributed model of standards education is preferred over a dedicated model.
    - Overwhelmingly, professors say they would like to see standards education included when appropriate and relevant in coursework, assignments, and lectures rather than offered as separate, stand-alone courses or programs. This model may differ from initial instincts, it may not be what some others in standards education are pursuing, and it may be harder to deliver, but it is what is wanted and needed.
2. There is great openness to the idea of including standards education and equally great need for materials and support to do so.
    - Those who support standards education need to choose the most critical elements, provide documentation, and train the trainers. Inclusion of standards education in EE curriculum around the world can happen with the support of standards educators. It won't happen without us.

Susan Tatiner has been with the IEEE since 1995. She is the Director of Government Relations & Standards Education for the IEEE Standards Association.

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Incorporating Standards Education in University Curriculum

By Amin Karim

September 2011

When we studied engineering, we were made aware of the various types of engineering standards created by professional bodies such as the IEEE, American Society of Mechanical Engineers (ASME), or American Society of Civil Engineers (ASCE). However, in courses where we designed and crafted a product, complying with a specific standard was seldom a design criterion. We typically used components and parts that were standards-based or met certain codes and regulations. As a result, we were not trained to select and apply standards as a design requirement. In industry, only a handful of engineers understood and selected appropriate standards and used these to guide other engineers in applications. This, however, is not sufficient in today's engineering work environment.

Over the past two decades, industry and government employers have indicated that being knowledgeable of and learning to apply standards is now one of the engineer's job requirements. The business environment is extremely competitive and international standards and standardization systems are playing an increasingly important role in all areas including technology, finance, trade, and environmental law. Applications of Internet technologies, sustainability concerns, and globalization have influenced such changing job requirements. The new job skill has been validated via multiple employer and standards association surveys. To ensure that engineering graduates acquire the "standards skill," ABET's Engineering Accreditation Criteria has included a requirement that " Students must be prepared for engineering practice through a curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier course work and incorporating **appropriate engineering standards and multiple realistic constraints**."

This column has been reserved for academic administrators, faculty, and students to discuss their approaches to the challenges of teaching and learning standards within an undergraduate curriculum that is already full. In addition, a limited number of publications on standards, lack of case studies on standards application in existing textbooks, plus difficulty in accessing standards documents add to these challenges. In the following section, Professor Candace Sulzbach, a faculty member of the Colorado School of Mines describes their capstone project process:

> The Senior Design Capstone Engineering class taught at Mines is a two-semester (3 credit hours/semester) course taught to civil, electrical, environmental and

mechanical specialty students. With over 250 students enrolled in this class in the fall of 2011, it is challenging to ensure that students, who work in teams of 5-7, understand the importance of using engineering standards as they develop a solution to their individual design project.

Senior Design teams work both semesters with a Faculty Advisor, Technical Consultant and a Client. The Client is the person who proposed the project and has requested a solution to a problem, while the Faculty Advisor is charged with working closely with the team through weekly meetings, monitors their progress and grades all of their work. The Technical Consultant is a faculty member charged with being available to help the students with technical problems that arise with their projects along the way. As part of the Senior Design Leadership, we require that student teams develop requirements and specifications that can be proven through experimentation and analysis. Generally, students either use the library, online via their professional society memberships, or via clients who want a particular standard applied. Not everything is readily available - but students are pretty industrious about finding a source. Their final design is subjected to a verification and validation analysis. Engineering standards are a part of this process but apply so differently to each project, due in part to the variety of projects, but also due to the variety of engineering specialties. The introduction of specifications happens more with students' interactions with their Client, Faculty Advisor and Technical Consultant rather than by lecture presentation."

For future issues of the IEEE Standards Education eZine, we welcome short articles from faculty and students on teaching and learning of standards at your institution.

Interested parties may submit an inquiry or article abstract for consideration to the Editorial Board at any time throughout the year via email to: ezine-eb@listserv.ieee.org.

The IEEE actively promotes the integration of standards into academic programs. On 28 June 2009, the IEEE Board of Directors approved the IEEE Position Paper defining the desired role of technical standards in education within engineering, technology, and computing (ETC) academic curricula in the technical areas of interest of the IEEE.

Read the IEEE Position Paper on the Role of Technical Standards in the Curriculum of Academic Programs in Engineering, Technology and Computing (DOC, 42 KB).

Amin Karim is the Director of Academic Outreach at DeVry University. Prior to this position, he served as the national dean of the college of technology for approximately eight years. Before joining DeVry in 1991, he served as an electrical engineer in the power and manufacturing industry and as a faculty and a department head of engineering technology program. He is a past Chair of the Electronics and Computer Engineering Technology Department Heads Association of the American Society for Engineering Education and served as a TAC of ABET evaluator for engineering technology programs. Currently, he is serving as the vice-chair of the Standards Education Committee for IEEE.

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Introducing IEEE Standards Education Committee Student Application Paper grants

by David Law

September 2011

3Knowledge of industry standards helps facilitate the transition from classroom to workplace by aligning educational concepts with real-world applications and market constraints. IEEE encourages the introduction and use of technical standards in the classroom.

In support of the IEEE Standards Education Committee's (SEC) mission, in particular to actively promote the integration of standards into academic programs, the IEEE SEC is offering grants to both students (500 USD) and faculty mentors (300 USD) to promote the use of industry standards in projects.

These grants are offered to students in all stages of their study (e.g., undergraduate, post graduate, doctoral) and for all types of projects (e.g., design, development, research). The grant requires submission of a paper on completion of the project describing the design choices driven by, and the application of, industry standards in meeting the project goal. This provides the applicant(s) the additional opportunity of having a paper published by the IEEE.

The application process is reasonably lightweight and so far the success rate of application has been high, with the main reason for rejection being meeting the requirement to use industry standards in projects. The key to a successful application is to have a project that is based on the investigation or application of industry standards.

Simply using components that conform to a particular standard, for example using an IEEE 802.11 WiFi Router to communicate a WiFi connected laptop as part of the project, is not sufficient. What we wish to see is a paper that highlights specific design choices in the project driven by an understanding, and application, of the industry standard(s) used.

To learn more and to apply for a grant visit http://standardseducation.org/applications/.

The SEC reviews each final paper carefully and the accepted final papers are published to our Student Application Papers website. Please take some time to read through the successful papers for some inspiration.

David Law is a Distinguished Engineer at Hewlett-Packard Networking and has worked on the specification and development of Ethernet products since 1989. Throughout that time he has been a member of the IEEE 802.3 Ethernet Working Group where he has held a number of leadership positions. He served as the Vice-Chair of IEEE 802.3 from 1996 to 2008 and in 2008 was elected to Chair of IEEE 802.3. David has been a member of the IEEE-SA Standards Board since 2005, has served as the Chair of IEEE-SA Standards Board Review Committee (RevCom) since 2008, and is currently serving as the Chair of the IEEE Standards Education Committee. In 2000 he received the IEEE-SA Standards Medallion for 'leadership and technical contributions to Ethernet networking standards' and in 2009 he received the IEEE Standards Association Standards Board Distinguished Service award 'For long term service to improve the operation and integrity of IEEE-SA governance'. David has a BEng (hons) in Electrical and Electronic Engineering from Strathclyde University, Glasgow, Scotland.

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IEEE Student Project Grants: A Way to Beneficial Standards Awareness among Students

By Dr. M.Z. Hasan, Texas A&M University

September 2011

The IEEE Student Application Project grants support student projects that involve technical standards. The standard(s) may be implemented as software or hardware. In addition, the standard may be used to test a designed system. Either way, students are required to be aware of the particular technical standard involved in a project. Of course projects may be implemented with self-developed specifications and without any technical standards. While this makes the project implementation simple, such a project suffers the lack of acceptance. On the other hand, incorporation of technical standards in a project requires additional work. This additional work is supported by the IEEE grant. As such, clearly this grant can help motivate students to include technical standards in their projects.

As mentioned earlier, a project becomes more acceptable when it supports some technical standards. For engineering students, it is important to recognize that the projects they undertake should appeal to a broad spectrum of the technical and non-technical population. Technical standards are formulated by a wide consortium of professionals representing industry, business, and academia. As such, well formulated standards have far extending appeal. When such standards are blended in a project, it carries more weight. Such a project is more impressive to the interviewer when a student is interviewing for a technical position after graduation. So, the grants are useful in helping fresh graduates become more worthy of employment.

Projects supported by the IEEE grants are generally of short duration and of limited scope. If a project proves to be beneficial, the scope of the project could be extended. Even alternative approaches could be explored for further benefits or for comparison with the previous one. As such, the grants may enable the projects to move beyond the initial plan for the project. This could lead to consistency and high value to the students following the first group. This also enables a faculty to establish a track record and help set-up further research at a larger scale. Subsequently, the fruits of these projects can be introduced into the classroom with the faculty lecturing the relevant courses.

Students from Texas A&M have had the results from three successful projects involving technical standards published as final Student Application Papers by the IEEE.

- Reconfigurable System Development and Evaluation using Standard JPEG Kernels by Timothy J. Davis with faculty advisor support by Muhammad Z. Hasan.

Applications have different computation intensive segments called kernels. If these kernels could be implemented on hardware, execution time of the application could be reduced as compared to its software implementation. However, due to transitory nature of these kernels and limitation of the hardware resources, it is preferred to implement the kernels on reconfigurable hardware. ISO/IEC/ITU 15444 Joint Photographic Expert Group (JPEG) standard for data compression applied to still pictures is chosen as the target standard for achieving the project goal. The JPEG compression process involves the following phases: Discrete Cosine Transform (DCT), Quantization, and Run-length Encoding. As such, each of these phases represents a computational kernel and is implemented on hardware to speed-up the overall compression process. Performance of the hardware kernels will be measured and compared with the performance of software implementation.

- Environment Temperature Control Using Modbus and RS485 Communication Standards by Kosta Papasideris, Chris Landry, Brad Sutter and Archie Wilson with faculty advisor support by Dr. Joseph Morgan.
- Use of IEEE 802.X Standards in the Bottle-Net WANulator by Joseph Cerney, Kevin Schmidt, Ryan Becker, and Patrick Duffy with faculty advisor support by Dr. Joseph Morgan.

Dr. Muhammad Hasan is Assistant Professor at Department of Engineering Technology and Industrial Distribution at Texas A&M University.

Education: Ph.D. in Computer Engineering, New Jersey Institute of Technology.
Master of Electronic Engineering, Eindhoven University of Technology, The Netherlands.
Bachelor of Science in Electrical and Electronic Engineering, Bangladesh University of Engineering and Technology

Areas of Interest: Design, Testing, and Performance Evaluation of Computer Architectures and Embedded Systems; Use of Hardware Description Language (VHDL) for Design and Testing; Design Circuits on Field Programmable Gate Arrays (FPGAs); Design and Testing of Structured Digital Systems; Processing of Sparse Matrices from Databases, Energy optimization in computer/digital systems, Embedded controllers for energy efficient applications.

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More about Applying for IEEE Student Project Grants

The IEEE Standards Education Committee (SEC) offers grants of $500 for students and $300 for faculty mentors to help with graduate and capstone design projects that include an industry standards component. Students report on the results of these projects by writing and submitting Student Application Papers. The SEC reviews each final paper carefully and the accepted final papers are published to our Student Application Papers website.

Applications for the grants may be submitted at any time throughout the year, however the next upcoming deadline for fall 2011 is 15 October.

Frequently asked questions about the IEEE grants

1. **What are the grants for?** The grants are to help support students at colleges and universities worldwide with their design projects. The funds are generally used to purchase much needed materials to help students' projects succeed. The one absolute requirement is the projects include the application of industry standards.
2. **Who can apply?** Any college-level student planning to incorporate industry standards or specifications into their projects, and are in need of additional financial support. Keep in mind that students must produce a final paper, a Student Application Paper, that will be submitted to the Standards Education Committee (SEC) for review. If the SEC accepts the paper, it is published to the IEEE's website.
3. **Do I need to be an IEEE member and do the standards we use have to be IEEE standards?** The answer to both of these questions is no. The standards education grants are for all students worldwide, and as long as your project is using the appropriate technical standards for your project, the SEC requirements have been met.
4. **How do I apply?** Go to our Student Application Papers website: http://standardseducation.org/applications/. There you will find more information as well as the application and instructions, which is also linked below.
   - Application and Instructions (DOC, 61 KB)
   - The next upcoming deadline for applications is 15 October 2011 and the one after that is 15 December 2011.

Read successful final Student Application Papers.

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Best of Student Application Papers

In each issue we will publish selected examples of final application papers from students who received IEEE grants to help with projects that include technical standards.

The following paper is an example of a successful project with good applications and a well-written final report.

Using ISO 15693 Compliant RFID Tags in an Inventory Control System

University: Louisiana State University, Baton Rouge, Louisiana

Course: Undergraduate Capstone Project

Student Team Members: Joseph Gates, Vishwajeet Potnis, Matthew Howell, William Tran

Faculty Advisor: Mr. John Scalzo

Abstract:

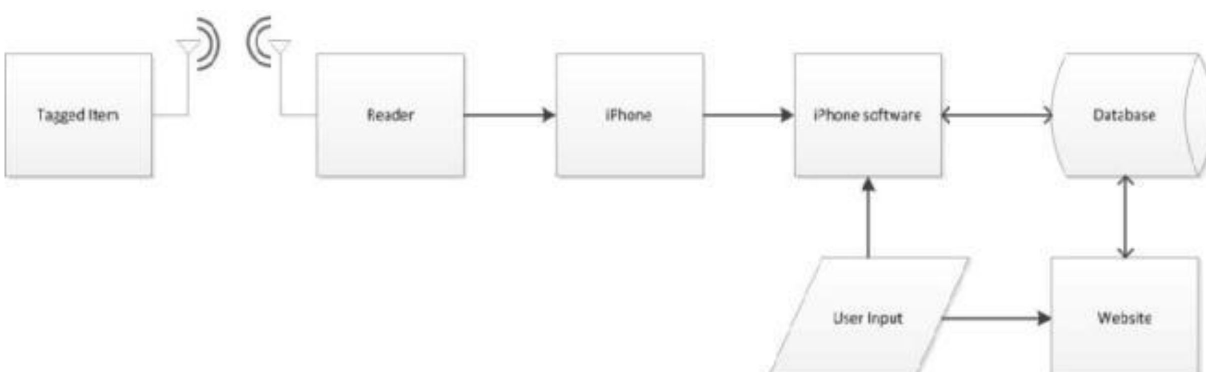

Figure 1: Top-level system summary

For an inventory control system to be effective, it must be scalable, cost-efficient, and easy to use. Currently, commonly used inventory control systems tend to be lacking in these areas, making the inventory process a time-consuming endeavor. For this project, an analysis of the inventory management system currently in place at Louisiana State University was used to define several goals for a new inventory system design. LSU's current system, as used by property management and the various departments of LSU, is an arduous process, involving printed notifications sent to each department listing the complete inventory of the department, the use of an aging database to store and access the item and department information, and manual entry of information into and retrieval of

information from this database using an outdated interface. The complete inventory process currently requires a full year to complete. The major goal of this project is to streamline this process.

At the highest level, the inventory control system designed for this project can be described as 5 distinct parts: tagged items, reader, iOS application, database, and web application. The tags used to identify each item are passive RFIDs operating at 13.56MHz. The reader communicates with the tags, and the tags respond with their unique codes modulated onto this carrier frequency. Hardware on the reader demodulates and decodes the signal, and the resulting data is interfaced to an iOS device serially through the 3.5mm headphone jack on the device. The iOS device will be programmed, using the iOS programming interface, to interpret the data received through the headphone jack and to provide a simple user interface. A MySQL database will be used to store item, room, department, and user information. The device will maintain a persistent connection to the database using either Wi-Fi or 3G in order to provide real-time results while scanning items. Finally, a web site will be designed and implemented using Apache and PHP to provide administrative access to the database, as well as analyst access for generation of reports and notifications.

The ISO 15693 standard defines the operation of vicinity cards (passive RFID tags) operating at a frequency of 13.56MHz. Part 1 of the standard describes the physical characteristics of tags, part 2 describes the air interface and initialization between a tag and a reader, and part 3 describes the transmission protocol. An ISO 15693-2 and ISO 15693-3 compliant RFID tag from Texas Instruments is used to tag each item in the inventory system. Each tag has a 64-bit unique identification number (UID) and 256 bits of user programmable memory arranged is 8-bit x 32-bit blocks.

Since the RFID tags are passive, power transfer is achieved by coupling the magnetic field in the antenna of the reader with the antenna of the tag. The field required to activate the tag can range between 150mA/m to 5A/m.

Communication between the tag and the reader is a three step process. The tag is first activated by the 13.56MHz RF field of the reader, and then begins to wait for a command. The reader then transmits a command to the tag and awaits a response. If a valid command is received by the tag, it determines the appropriate response and transmits it back to the reader. All data transmission is achieved through modulation of the 13.56MHz carrier frequency.

For communication from the reader to the tag, data is modulated using amplitude shift keying (ASK) using either 10% or 100% modulation depths. Data is coded using either 1 out of 4 or 1 out of 256 pulse position modulation and is delimited by start of frame and end of frame signals. For communication from the tag to the reader, data is modulated using a subcarrier with Manchester coding. More details can be found in sections 7 and 8 of the ISO-15693-2 standard.

In order to obtain the unique identification number (UID) of an RFID tag, the correct command must be sent to the tag, in accordance with the ISO standard, specifically sections 7.2.2, 7.3, 7.4, 10, and annex C of the ISO-15693-3 standard. For a basic inventory command, 40 bits must be transmitted to the tag. The first 8-bits in the sequence define the flags sent to the tag that specify the actions to be performed by the tag. The next 8-bits specify the 'inventory' command followed by an 8-bit mask. A 16-bit CRC is then transmitted for error checking. All bytes are transmitted with the least significant bit first.

Hardware:

Antenna:

The antenna used to couple the magnetic field produced by the reader with the antenna built into the tag was created on a PCB designed for this project. The artwork used for this board produced an antenna with a calculated inductance of about 1μH. A variable capacitor and two fixed value capacitors were added to create a tank circuit with a resonance frequency of 13.56MHz. Another network of capacitors was added in series to the circuit to facilitate tuning the input impedance of the antenna to 50Ω. The completed antenna schematic is shown in figure 2, and the antenna board itself in figure 3.

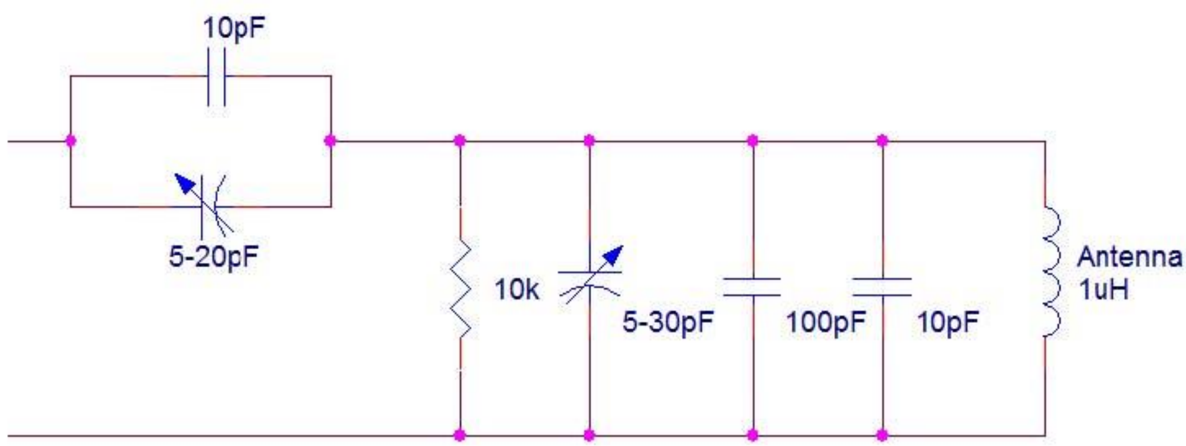

Figure 2: Antenna schematic

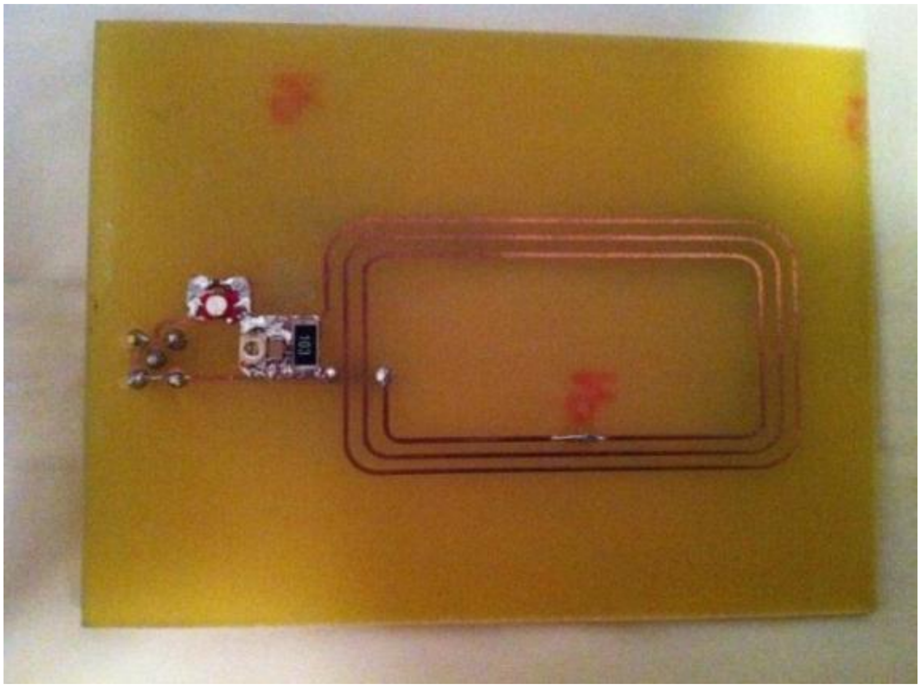

Figure 3: Complete antenna

In order to accurately tune the antenna to 13.56MHz, it was connected to a network analyzer for a one port S11 test, in order to measure the input reflection coefficient. Ideally, the result of the one port test would be to have the antenna tuned such that the minimum S11 value occurs at 13.56MHz. This would indicate that the maximum amount of the power of the transverse electromagnetic signal propagating to the antenna is being absorbed and hence radiated by the antenna at this frequency. By adjusting the variable capacitor present in the antenna circuit, we were able to tune the antenna to the point shown in figure 4 at marker 1, which represents the desired point of minimal S11.

The input impedance of the antenna was adjusted similarly by tuning the variable capacitor connected in series with the circuit. Figure 5 is a Smith chart of the input impedance, where marker 1 shows the impedance to be about 66Ω at 13.56MHz, which is not ideal, but is within the acceptable range.

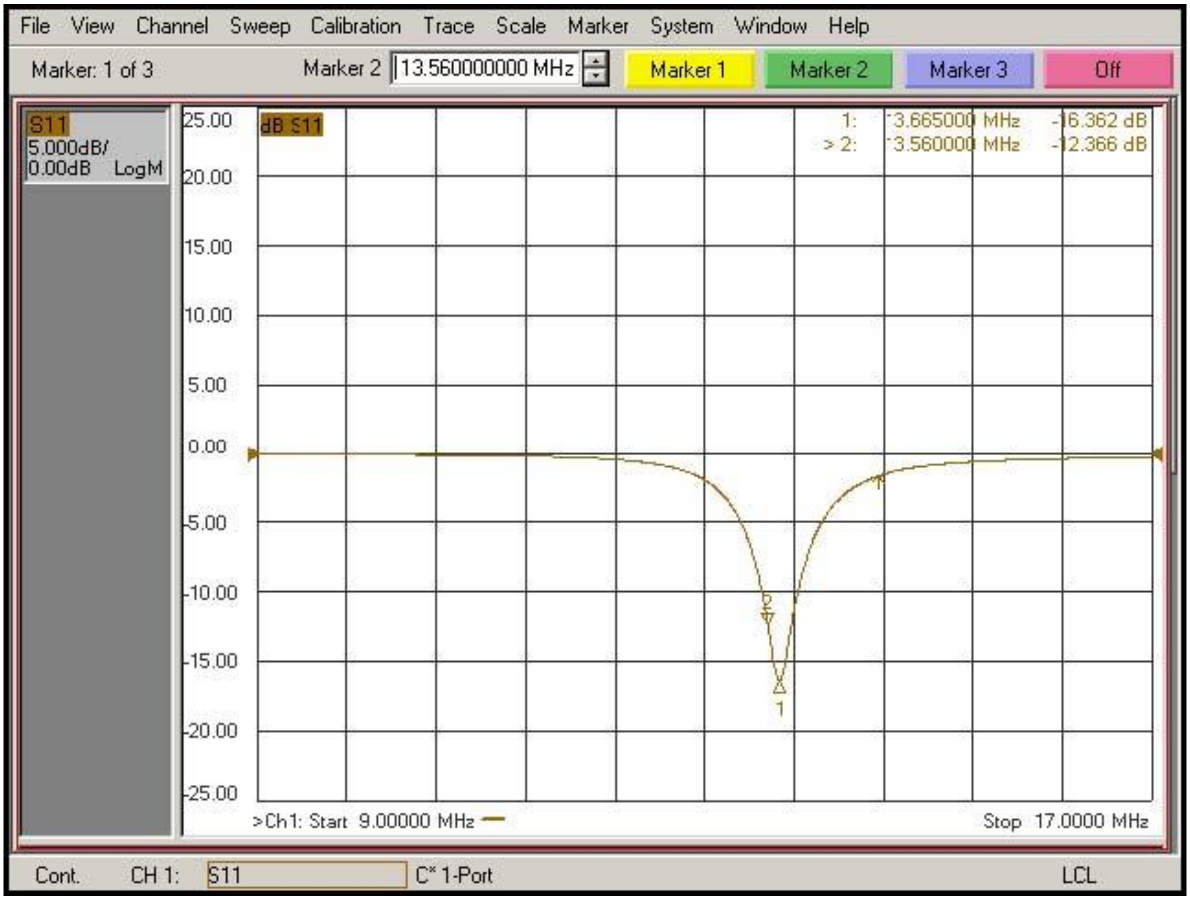

Figure 4: S11 result prior to tuning

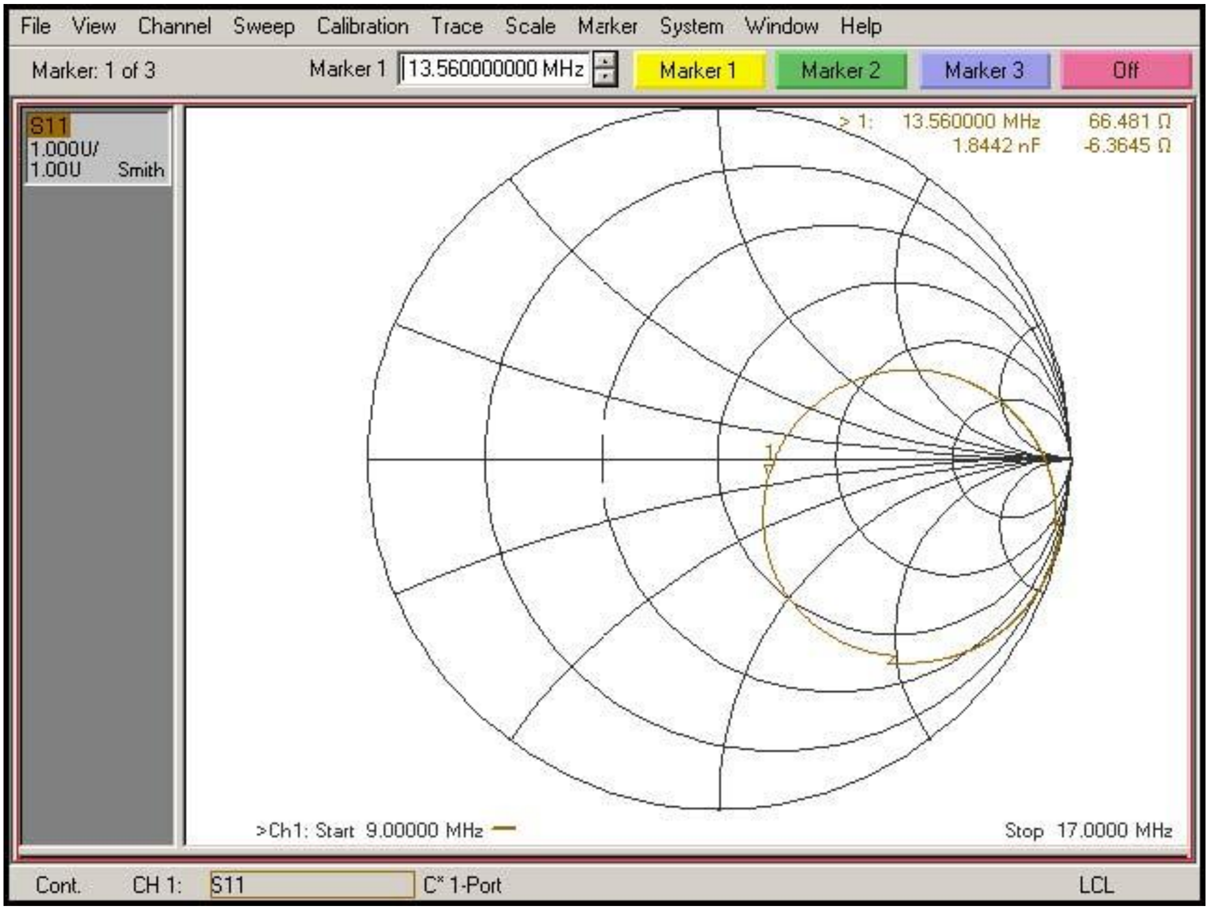

Figure 5: Antenna circuit Smith chart

Transceiver IC:

To simplify the circuitry involved for modulating and demodulating the data to and from the RFID tag, a multi-protocol transceiver IC from Texas Instruments was used for this project. This IC, the RI-R6C-001A, is a low power device designed for RFID systems operating in the 13.56MHz range. The chip interfaces with the antenna and a microcontroller to create a complete RFID reader/interrogator system. Figure 6 shows the TI recommended application schematic that was used for the construction of the reader. An Atmel ATMega328 with the Arduino bootloader installed was the microcontroller of choice for this project.

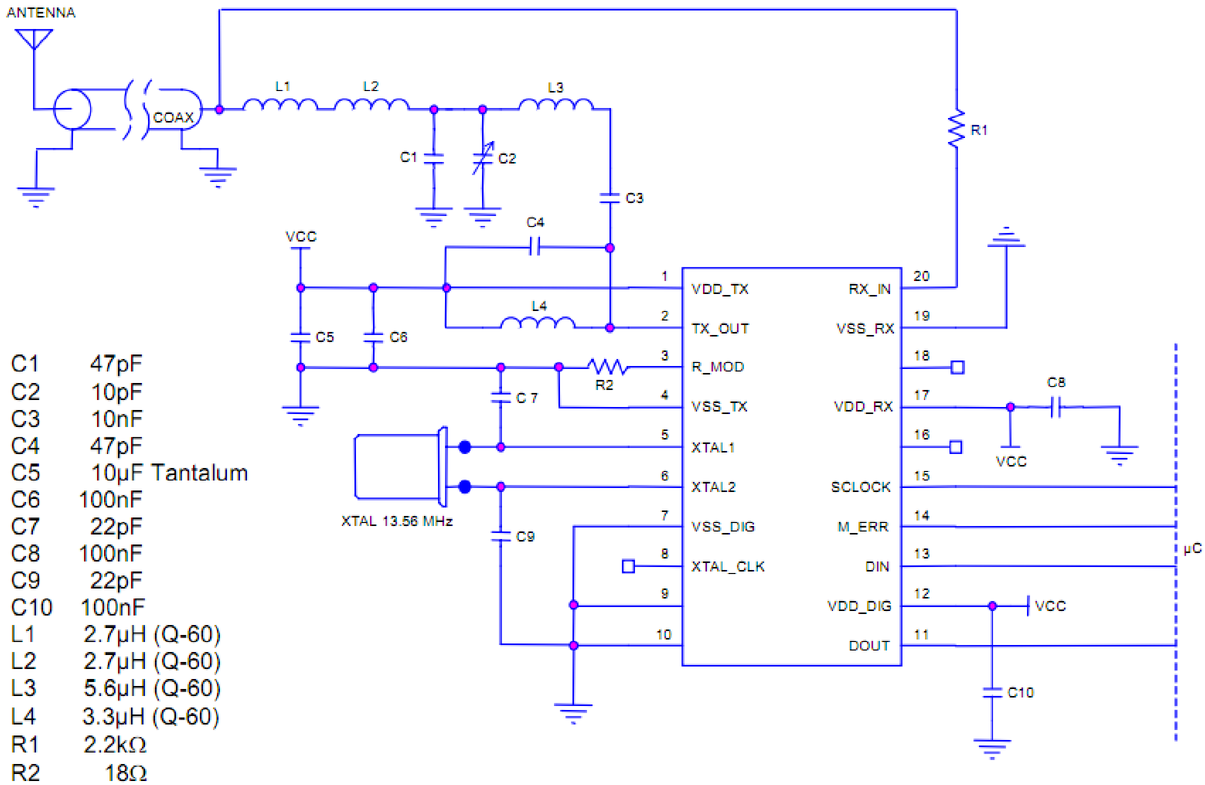

Figure 6: Recommended application schematic for RI-R6C-001A (Source: Texas Instruments)

The communication protocol used by the transceiver IC utilizes a simple three wire serial link between the transceiver and a microcontroller to transmit and set up data. There are 4 pins on the transceiver IC that interface with a microcontroller for communication, namely, SCLOCK, M_ERR, DIN, and DOUT. The SCLOCK pin is used as a bi-directional serial clock, while the DIN and DOUT pins are used as data input and output to the chip, respectively.

For each communication transaction, the microcontroller sets the necessary logic levels on the DIN and SCLOCK lines to send an appropriate sequence of commands to the IC and awaits a response from it. A typical command is structured as a start bit, a command byte, a variable-length string of binary data to be relayed to the RFID tag (the length of which depends on the message being sent), and a stop bit. The command byte sets the communication protocol used by the transceiver, setting parameters such as the modulation index (10% or 100%), pulse position modulation coding (1 out of 256 or 1 out of 4), etc.

Figure 7 shows a timing diagram that illustrates the relationship between the SCLOCK and DIN pin while a command is being transmitted to the IC. The start bit (S1) defines the start of a command sequence and is characterized by a low-to-high transition on the DIN line while SCLOCK is held high. The stop bit (ES1) defines the end of the command sequence and is a high-to-low transition on the DIN line while SCLOCK is held high. Each data bit between S1 and ES1 is latched in the IC on the rising edge of SCLOCK. The value of the data bit on DIN should remain constant for the duration of SLOCK being held high.

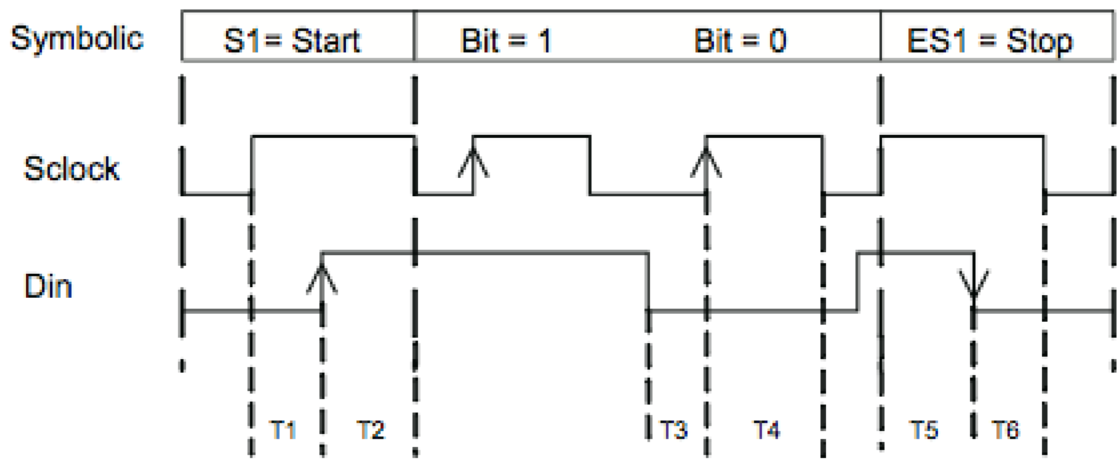

Figure 7: Timing diagram for the communication protocol (Source: Texas Instruments)

Once the entire command sequence has been sent, the transceiver IC modulates the data sent to the tag on a 13.56MHz carrier in accordance with the protocol defined in the ISO 15693 standard. The signal is transmitted through the attached external antenna. The tag responds appropriately to the request and transmits data back to the transceiver IC. The received signal is demodulated by a diode envelope detector and then processed inside the IC. The sequence of data from the tag's response is transmitted by the IC between a start and a stop bit, indicated by SCLOCK and DOUT. The transceiver IC clocks the data into the microcontroller using the SCLOCK and DOUT lines. Each data bit is latched at the rising edge of the clock. A timing diagram of the entire process of communication between the microcontroller and the transceiver IC is shown in figure 8.

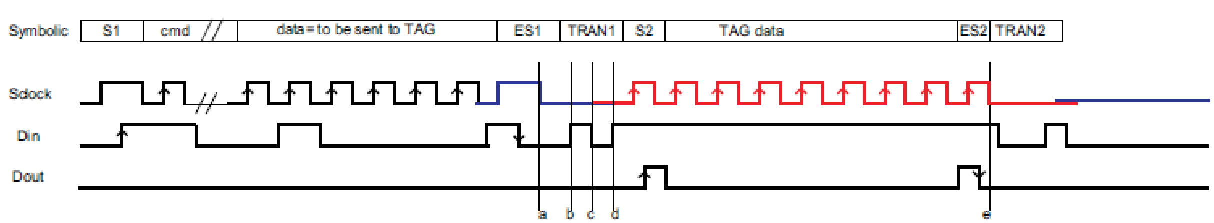

Figure 8: Full communication protocol (Source: Texas Instruments)

The microcontroller transmits data to the transceiver IC by changing the logic levels on the SCLOCK and DIN lines at the appropriate times, as described in the communication protocol. The microcontroller first sends the IC a command to initialize its transceiver.

Figure 9 shows the voltage across the antenna once the transmitter is switched on. The output waveform is a very clean 13.56MHz sinusoidal wave that is used as a carrier to transmit data to the tag.

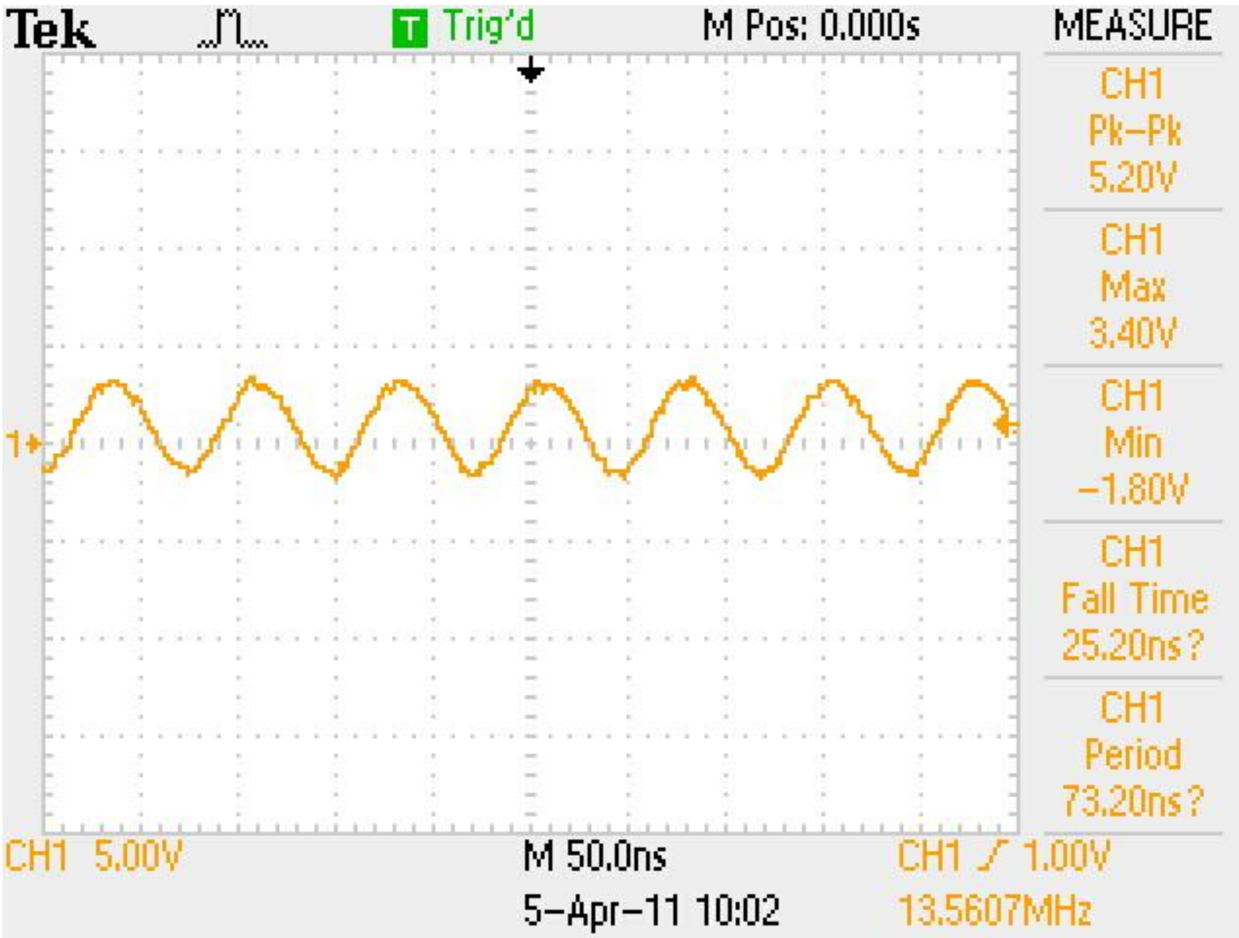

Figure 9: Voltage across the antenna

Once the transmitter has been initialized, the microcontroller sends the sequence of bits required to obtain the unique ID of the tag, as described in the ISO-15693 standard. Figure 10 shows the output signal from the microcontroller on the SCLOCK and DIN lines. The diagram has been labeled to show the appropriate sections of the sequence.

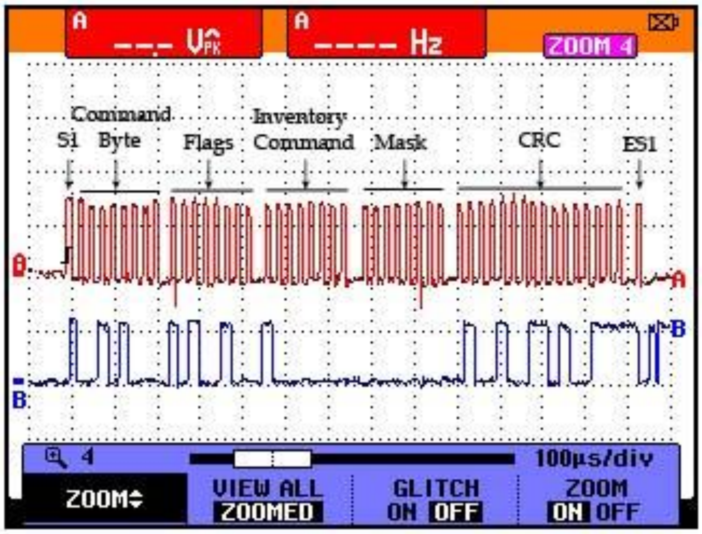

Figure 10: Command sequence sent to the transceiver IC

If a tag is present in the field of the antenna, the transceiver IC demodulates the response from the tag and transmits it to the microcontroller. The message sent by the transceiver IC contains a start bit, 96 bits of data from the tag (containing flags, the DSFID, and the UID as defined in ISO 15693-3), 2 bits indicating an end of file, and a stop bit. Since each data bit is latched onto the rising edge of SCLOCK, the microcontroller checks for interrupts on SCLOCK and reads the logic level on the DOUT line in the ISR for that interrupt.

Figure 11 shows the full response to the microcontroller of a sample tag that was used for testing. The red waveform is the DOUT line and the blue waveform is the SCLOCK line. A zoomed in version of the same signal, as shown in figure 12, demonstrates how the data bits are clocked into the microcontroller.

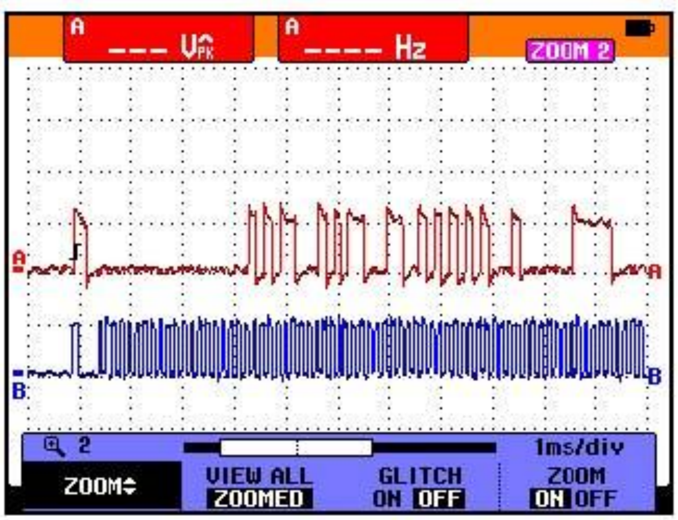

Figure 11: Response from RFID tag

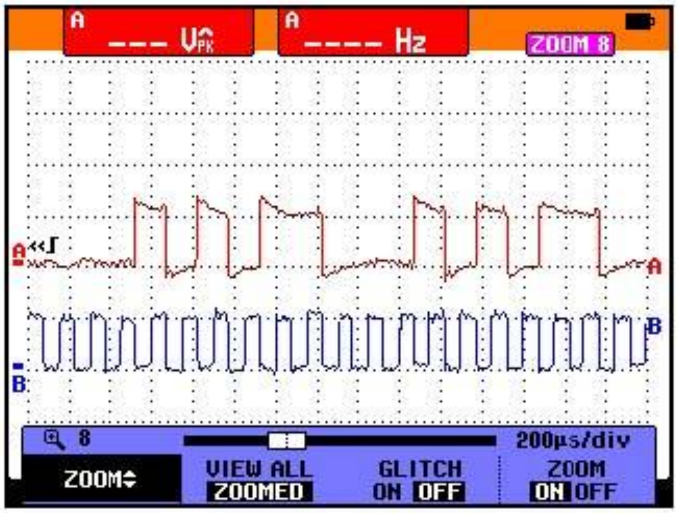

Figure 12: Response from RFID tag (zoomed)

The response from the transceiver IC is transmitted with the least significant bit first. Details of the format of this data string can be obtained from section 7.3 of the ISO-15693 standard. Functions for decoding the response received from the tag were programmed into the microcontroller, and the full 64 bit UID is stored in its memory as 8 separate bytes.

iOS device Interface:

A TRRS (tip-ring-ring-sleeve) headset connector was used for the physical layer of communication between the microcontroller and the iOS device. The TRRS connector, shown in figure 7.23, has 4 different connections, one each for the left speaker, right speaker, microphone in, and ground. The microphone line is used to transmit the UID that has been received by the microcontroller to the iOS device. The microphone line must present a particular impedance in order for the iOS device to detect that a microphone has been connected.

For the purpose of this project, the iOS application was programmed to accept a 32-bit FSK input from the microcontroller. The microcontroller uses a "bit banging" method for transmitting the UID serially through a digital output pin using FSK. For a 0 bit, the microcontroller toggles the logic level of the output pin at a rate of 1kHz for 1/32 of a second, and for a 1 bit the logic level of the output pin is toggled at a rate of 4kHz for 1/32 of a second. The least significant 32 bits of the UID are transmitted to the iOS device using this method. It therefore takes 1 second to transmit the entire string of data. Since the microcontroller uses TTL logic levels to output signals, the signal was attenuated to acceptable levels of the microphone input at around 50mV using a diode clipping circuit and an op-amp with an attenuation of 350. Figure 13 shows the plot and the Fourier transform of a sample FSK signal transmitted from the microcontroller in MATLAB. The large peaks visible in this Fourier transform occur at the desired frequencies of 1 kHz and 4 kHz, indicating that the signal generated by the microcontroller is as expected. Figure 14 shows a photograph of the implemented hardware of the reader system.

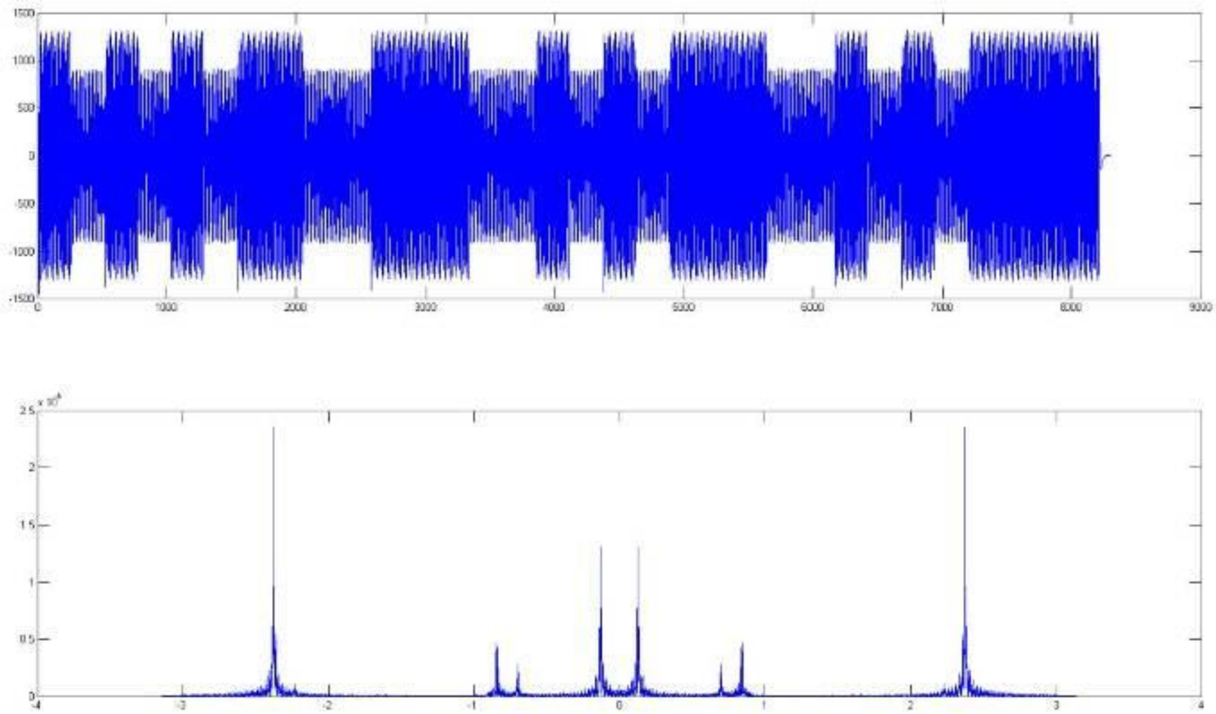

Figure 13: FSK signal sent to iOS device

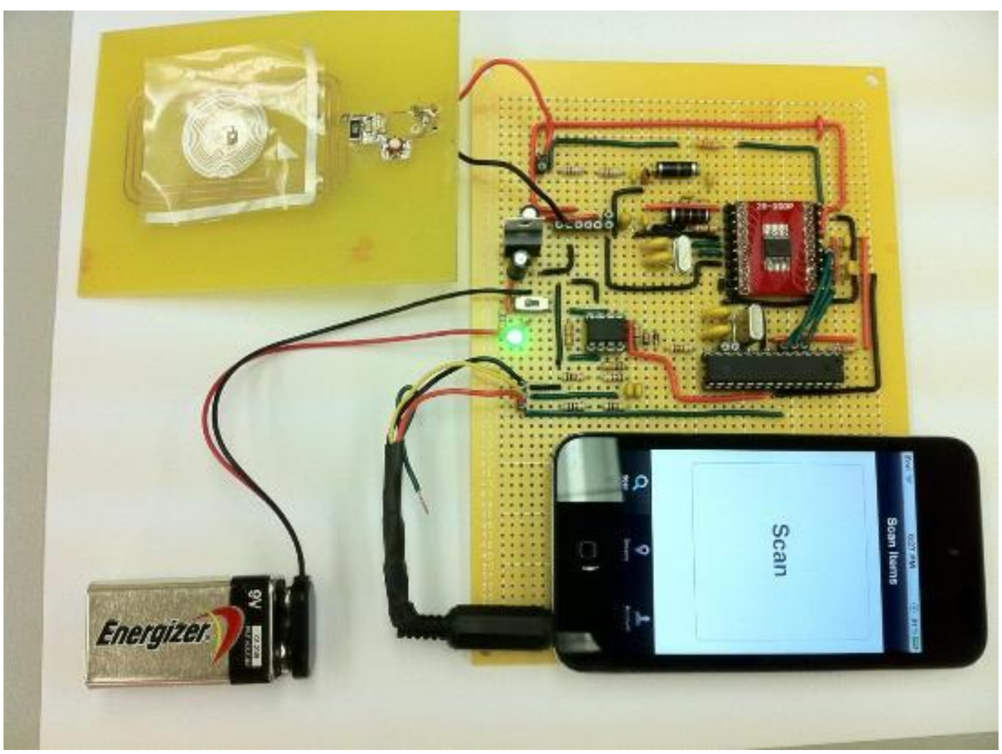

Figure 14: Complete reader system

Database and Website:

All user, department, and item data is stored in a single, centralized database. The database management system used for this project is MySQL. For security reasons, this database can be accessed only from the local server, and is available to sever-side application code through the MySQL PHP extension. Apache is used to host several PHP scripts that not only generate the content for the website, but also provide a secure API used by the iOS device to access the database.

The iOS database API is secured by requiring user authentication before any actions affecting the database can be performed. This authentication process, if successful, generates a unique authentication token for the user. Every request following this login will be validated by the API using this authentication token. After the API parses a valid request, it queries the database and returns the results to the iOS device using JavaScript Object Notation.

The website provides separate functionality for each level of user: administrator, analyst, or department custodian. Administrators are given access to various control panels which provide easy methods of managing departments, items, and users. Analysts are given access to report and notification generation systems, which together reduce the amount of paper required as compared to common inventory control systems. Finally, department custodians are only allowed to view their account information and the list of items in their assigned department. The administrator and analyst user classes are supersets of the department custodian class. An items listing for a test user is shown below in figure 15.

Figure 15: The items page offers a sortable table of all items tied to a user's department

The website is implemented in a modular fashion, with all requests first passing through the index file. All pages, with the exception of the login page, require authentication. Before any request is interpreted, the authentication is verified by checking the PHP $_SESSION array for an authentication variable. After it is verified that a user is authenticated, the URL is parsed and the file containing the HTML elements for the requested page is loaded. All variables that are passed into SQL queries are sanitized to prevent SQL injection attacks. To provide security in the event of a database compromise, all passwords are salted and hashed before being stored in the database.

iOS Application:

In order to provide a powerful and user-friendly interface to both the reader hardware and the inventory database, an iOS application was developed. This application serves as the primary user interface to the RFID tag reader hardware by receiving and interpreting the UID values read from tags by the hardware and passing them along to the server for processing. The UID data sent from the microcontroller is interpreted in the iOS application by recording the signal as a set of audio samples, dividing this list of samples into sections, one for each bit, and then performing a Fourier transform on each section in order to determine the dominant frequency. The application allows for the interpreted UID value to be used in three ways; to simply mark the item associated with a UID as scanned in the database, to associate a tag UID with an item that does not currently have one, or to create an entirely new item entry associated with the scanned UID in the database.

In addition to this tag reading functionality, the iOS application also serves as a general client to the database. Using the application, users can see listings of the buildings, rooms, and items which they are responsible for in the inventory database. They can also easily evaluate their progress through the current inventory cycle, thanks to the presence of counts of unscanned items in each building and room location on the associated listings screens for those locations. A sample building listing is shown below in figure 16. Users can also see details for an individual item, and request that the database mark an item as scanned without actually scanning its tag, if necessary. This screen is shown in figure 17.

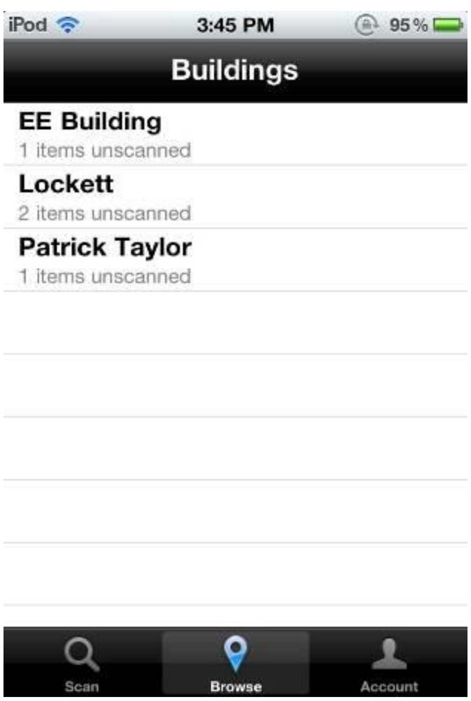

Figure 16: Sample items listing

Figure 17: Sample item details

Conclusion:

In conclusion, this inventory tracking system has been designed with the goals of reducing waste and reducing effort as compared to the arduous processes which are currently common, involving printed notifications listing the complete inventory, aging databases to store and access items and department information, and tedious, manual entry of information into and retrieval of information from the database from an outdated user interface. It is believed that the paperless system featuring wireless tag scanning designed for this project meets these goals, while also being simple to use and incorporating a centralized database system featuring real-time data feeds. Industry standards contributed to streamlining the implementation of this project and also ensuring interoperability between our project and existing devices on the market throughout the world.

References:

[ISO15693-2] ISO/IEC stage 15693-2: Identification cards -contact-less integrated circuit cards - vicinity cards – Part 2: Air interface and initialization, 2000-05-01, International Organization for Standardization, Geneva, Switzerland.

[ISO15693-3] ISO/IEC stage 15693-3: Identification cards -contact-less integrated circuit cards - vicinity cards – Part 3: Anticollision and Transmission Protocol, 2001-04-01, International Organization for Standardization, Geneva, Switzerland.

"HF Antenna cookbook." Texas Instruments.
<http://www.ti.com/rfid/docs/manuals/appNotes/HFAntennaCookbook.pdf>

"HF Reader System Series 6000" Texas Instruments.
<http://focus.ti.com/lit/ug/scbu030/scbu030.pdf>

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IEEE Standards Education Funny Pages...

This cartoon appears in the book "Ten Commandments of Effective Standards" by Karen Bartleson. Reproduced with permission from Rick Jamison. © Rick Jamison.

***Editorial Note: There actually is an IEEE Standards Working Group working on a project called P1823, Standard for a Universal Power Adapter for Mobile Devices.

Funny video about a Medieval Help Desk (You Tube video).

Contributions

Have something amusing (cartoon, video) related to standards you'd like to share? Contact our IEEE eZine staff editor Jennifer McClain at j.mcclain@ieee.org.

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Standards Development 101

Getting involved in the development of IEEE standards provides you the opportunity to network with industry peers, broaden your understanding of industry and technology, and gain familiarity with the content of standards in which you are involved—facilitating early compliance and anticipating market requirements.

There are many ways to get involved in IEEE standards. You can:

- **Submit project request**—to start a new standard.
- **Join working groups**—to develop standards.
- **Join invitation pools**—to express your interest in voting or balloting on standards.
- **Become a member of a balloting group**—to vote on the technical integrity of the standard.
- **Become an individual or corporate member of the IEEE-SA**—to get connected to a community of standards developers and users.
- **Become a member of our governance**—to ensure the standards process has been followed and to help set the direction of the IEEE-SA.
  » IEEE-SA Standards Board
  » IEEE-SA Board of Governors

Each IEEE standard follows a set path from concept to completion, which adheres to the principles of due process, openness and consensus. These principles allow for equity and fair play so no one interest category dominates the process, and any organization or person with a desire to participate in a proposed standard can do so.

Visit the IEEE Standards Association Second Life site to learn more about the IEEE Standards Association and development process.

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Recent and Upcoming Standards Education Events

Academic and Student Paper Competitions

IEC-IEEE Challenge: The IEC and IEEE invite the world's Academics to submit papers that analyze the impact of electrotechnology (electricity & electronics) on economic, social and environmental development.

Registration opens on 28 October 2011. Visit http://iecieeechallenge.org/.
1st prize: USD 20 000, 2nd prize: USD 15 000, 3rd prize: USD 10 000.

Upcoming Workshops and Conferences

IEEE AFRICON 2011: 13-15 September 2011, Zambia. Theme of the conference is "Sustainable Energy & Communications Development."

Jon Rosedahl, IEEE 802.11 Vice-Chair and Executive Secretary of IEEE 802, will present a "Demystifying IEEE 802 Standards" Workshop on 14 September.

For the full program and more information visit http://www.africon2011.co.za/

Advanced Energy 2011, Buffalo, New York, 12-13 October 2011. The conference is co-located with the IEEE Region 1 Smart Grid for Practitioners Conference sponsored by the IEEE Future Directions Committee.

IEEE Standards Association Board of Governors member Tom Prevost will speak on the topic of Smart Grid Development in the United States on 13 October 2011.

For more details and to register for the conference visit http://www.aertc.org/conference2011/.

Recent Events

The ICES Workshop and the WSC Academic Day 2011 was held on 27-29 June 2011 at China Jiliang University (Hangzhou, China). The theme for the workshop was: Cooperation between Standards Development Organizations and Academic

Institutions.

Purdue University Professor and IEEE Standards Education Committee member, Bruce Harding, delivered a presentation on behalf of the IEEE on What the IEEE Learned from Global University Outreach. To view the presentation click here (will launch in a new window).

Note: The International Cooperation on Education about Standardization (ICES) is a network of individuals and organizations interested in education about standardization. ICES was established at a meeting in Tokyo in 6-8 February 2006 by people from industry, academia, and standards organizations. The foundation of ICES was prompted by a common desire to promote education about standardization and exchange educational approaches and materials internationally.

The World Standards Cooperation was established in 2001 by the International Organization for Standardization (ISO), the International Electrotechnical Commission (IEC) and the International Telecommunication Union (ITU), in order to strengthen and advance the voluntary consensus-based international standards systems of, ISO, IEC and ITU.

Future Events

2012 Capstone Design Conference, 30 May-1 June 2012, Champaign-Urbana, Illinois. Conference will provide a forum for engineering and applied science faculty to share ideas about improving design-based capstone courses. The conference theme will be Industry Involvement.

Stay tuned for more information....
If you would like to share information or announcements about any recent or upcoming events related to Standards Education, please contact our IEEE eZine staff editor Jennifer McClain at j.mcclain@ieee.org.

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Call for IEEE Standards Education eZine Contributions

The IEEE Standards Education eZine Editorial Board invites contributions from industry practitioners, educators and students on topics related to education about technical standards.

Interested parties may submit an inquiry or article abstract for consideration to the Editorial Board at any time throughout the year via email to: ezine-eb@listserv.ieee.org.

Abstracts should be no longer than 500 words and final articles should be no more than 2,000 words.

Particular areas of interest include, but are not limited to:

- standardization activities in technical areas such as Smart Grid and Networking Standards;
- impact and development of standards in various regions of the world;
- best practices and ideas for incorporating standards into the classroom and curricula.

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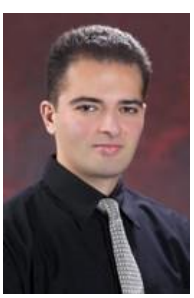
IEEE Standards Education eZine Editorial Board

Yatin Trivedi, Editor-in-Chief, is Director of Standards and Interoperability Programs at Synopsys. He is a member of the IEEE Standards Education Committee (SEC), represents Synopsys on the Board of Directors of the IEEE-ISTO and at the Board of Directors of Accellera. He represents Synopsys on several standards committees and manages interoperability initiatives under the corporate strategic marketing group. He also works closely with the Synopsys University program.
Prior to joining Synopsys, Yatin was Senior Director of Strategic Partnership Programs at Magma Design Automation. He worked with Semiconductor IP and Library suppliers, and EDA tools vendors to establish comprehensive supply chain solutions around Magma's digital design implementation and analysis flows.

In 1992, Yatin co-founded Seva Technologies as one of the early Design Services companies in Silicon Valley. He co-authored the first book on Verilog HDL in 1990 and was the Editor of IEEE Std 1364-1995TM and IEEE Std 1364-2001TM. He also started, managed and taught courses in VLSI Design Engineering curriculum at UC Santa Cruz extension (1990-2001). Yatin started his career at AMD and also worked at Sun Microsystems.

Yatin received his B.E. (Hons) EEE from BITS, Pilani and M.S. Computer Engineering from Case Western Reserve University, Cleveland.

Amin Karim is the Director of Academic Outreach at DeVry University. Prior to this position, he served as the national dean of the college of technology for approximately eight years. Before joining DeVry in 1991, he served as an electrical engineer in the power and manufacturing industry and as a faculty and a department head of engineering technology program. He is a past Chair of the Electronics and Computer Engineering Technology Department Heads Association of the American Society for Engineering Education and served as a TAC of ABET evaluator for engineering technology programs. Currently, he is serving as the vice-chair of the Standards Education Committee for IEEE.



Wael Diab is currently a Senior Technical Director in Broadcom's Office of the CTO working on technical strategy for the Infrastructure and Networking Group (ING).

Wael is a Senior Member of the IEEE and Vice-Chair of the IEEE 802.3 Ethernet Working Group. He is a member of the IEEE-SA Standards Board, IEEE Standards Education Committee (SEC) and was elected to the IEEE-SA Corporate Advisory Group (CAG). He is a published author, coauthoring

Ethernet in the First Mile: Access for Everyone, a book published by the IEEE, and was a contributing author to Broadband Services: Business Models and Technologies for Community Networks.

Wael holds BS and MS degrees in Electrical Engineering from Stanford University, a B.A. degree in Economics from Stanford, and an M.B.A. with honors from the Wharton School of Business. He has 57 issued US patents and has developed over 250 patents-pending in the networking space.

Bruce Harding is professor of mechanical engineering technology and coordinator of professional practice at Purdue University.

Professor Harding's scholarship and engagement activities revolve around the development and application of American National and ISO standards dealing with Technical Product Documentation (TPD) as it broadly relates to product realization, green manufacturing and other technical aspects of product lifecycle management (PLM).
He is active on a number of American National standards developing committees, and chairs the US Technical Activities Group (TAG) to ISO. He is ASME vice-president for Standardization and Testing, overseeing development of American National Standards for fasteners, geometric dimensioning and tolerancing, metrology, tools, pallets, threads, gaging, plumbing fixtures, metal mill products, chemical pumps, instrumentation, performance test codes and others.

Internationally, he has served as a US Delegate to APEC and has served as the Head of Delegation to ISO Technical Committee meetings in North America, Asia, Oceania, and Europe. Currently he chairs the 62-country ISO/TC10 committee on Technical Product Documentation, whose Secretariat is based in Sweden. The committee writes worldwide standards for technical product documentation for PLM.

Editorial Board Corresponding Members:

David Law is a Distinguished Engineer at Hewlett-Packard Networking and has worked on the specification and development of Ethernet products since 1989. Throughout that time he has been a member of the IEEE 802.3 Ethernet Working Group where he has held a number of leadership positions. He served as the Vice-Chair of IEEE 802.3 from 1996 to 2008 and in 2008 was elected to Chair of IEEE 802.3. David has been a member of the IEEE-SA Standards Board since 2005, has served as the Chair of IEEE-SA Standards Board Review Committee (RevCom) since 2008, and is currently serving as the Chair of the IEEE Standards Education Committee. In 2000 he received the IEEE-SA Standards Medallion for 'leadership and technical contributions to

Ethernet networking standards' and in 2009 he received the IEEE Standards Association Standards Board Distinguished Service award 'For long term service to improve the operation and integrity of IEEE-SA governance'. David has a BEng (hons) in Electrical and Electronic Engineering from Strathclyde University, Glasgow, Scotland.

Donald Heirman is president of Don HEIRMAN Consultants, training, standards, and educational electromagnetic compatibility (EMC) consultation corporation. Previously he was with Bell Laboratories for over 30 years in many EMC roles, including Manager of Lucent Technologies (Bell Labs) Global Product Compliance Laboratory, which he founded, and where he was in charge of the Corporation's major EMC and regulatory test facility and its participation in ANSI accredited standards and international EMC standardization committees. He chair, or is a principal contributor to, US and international EMC standards organizations including ANSI ASC 63® (chairman), the Institute of Electrical and Electronics Engineers (IEEE), and the International Electrotechnical Commission's (IEC) International Special Committee on Radio Interference (CISPR) where in October 2007 he was named the chair of CISPR moving from the previous role as its subcommittee A chairman responsible for CISPR Publication 16. He is a member of the IEC's Advisory Committee on EMC (ACEC) and the Technical Management Committee of the US National Committee of the IEC.

In November 2008 he was presented with the prestigious IEC Lord Kelvin award at the IEC General Meeting in Sao Paulo, Brazil. This is the highest award in the IEC and recognizes Don's many contributions to global electrotechnical standardization in the field of EMC. He is a life Fellow of the IEEE and a life member of the IEEE EMC Society (EMCS) and a member of its Board of Directors, chair of its technical committee on EMC measurements, past EMCS president, newly elected vice president for standards, and past chair of its standards development committee. He is also past president of the National Cooperation for Laboratory Accreditation (NACLA). He is past president of the IEEE Standards Association (SA), past member of the SA Board of Governors and past member of the IEEE's Board of Directors and Executive Committee. He is also the Associate Director for Wireless EMC at the University of Oklahoma Center for the Study of Wireless EMC. He has presented numerous workshops, tutorials, and technical papers internationally and is listed in several Who's Who publications. Mr. Heirman is a retired Commander in the US Navy.

Geoffrey O. Thompson is the Principal of GraCaSI Advisory Services and a senior member of the IEEE and IEEE-SA. He is Member Emeritus of the IEEE 802 Executive Committee and former chair of 802.23 and 802.3. He has served has served in numerous IEEE-SA governance positions and is a member of the Registration Authority Committee. He has over 40 years of business experience with Xerox and Nortel and has worked in Manufacturing, Field Service, Research and Development, and Standards Development. He received the BSEE from Purdue University in 1964 and has 12 U.S. patents. Mr. Thompson has been awarded the IEEE Standards Medallion and the IEEE Standards Board Distinguished Service Award.

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