

# RFID READER

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### Inside this issue:

UofA RFID Middleware	2
Lab Count	2
Calculating Read Rates	2
Tip of the Day	2
RFID Lab Helps Students Get Jobs	3
Fact or Fiction? Tracking	3
Student Profile	3



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## The “Cold Chain” and RFID

The University of Arkansas RFID Research Laboratory has lately been involved in testing temperature sensing RFID tags for the cold chain storage and distribution industry. Temperature sensing tags are semi-passive tags that have the ability to wake a battery assisted temperature sensor and take a temperature reading at almost any set interval. These tags come in a variety of form factors and can be as small as credit cards with batteries that can last for several years. A recent e-coli scare in the cold chain industry has emphasized the need to accurately track and record product location and temperature. Leading RFID vendors are producing low-cost temperature sensing tags that the lab has been able to measure for consistency and reliability in harsh environments.

Both the Electrical Engineering department and the local cold storage facility at Zero Mountain have assisted with providing extreme temperatures to which these tags have been subjected. Preliminary tests have shown promising results in this sector which is poised to make significant changes in how perishable product is transported, claimed against, and consumed.



## University of Arkansas Students Develop RFID Reader

Two University of Arkansas electrical engineering undergraduate students have built, from scratch, an entire RFID reader and tags. John Daily and John Garrett came up with the idea for their senior design project because of their interest in wireless technologies. Daily, now a graduate student working on tag-sensitivity projects in the RFID Research Lab, was primarily involved with reader-tag communication protocols for the passive tags the pair built.

“We didn’t really have a specific application in mind when we built the tags, we were more interested in efficiently and accurately creating a successful end product,” he said. “The way the system was designed allowed for tags within range to be either permitted or denied ‘clearance’ by the reader depending on whether or not they reported the correct identification protocol.” In addition, the reader backend was left open to further exploration with wireless communication protocols such as 802.11b, or other less complex designs, capable of transferring tag data from the reader to enterprise systems.

## UofA Designs RFID Middleware

TagCentric is open source RFID integration software developed by the computer science/computer engineering department at the University of Arkansas. The main function of TagCentric, at present, is to gather tag read information from RFID readers and deposit the information into a database. TagCentric also provides some device testing capabilities and some amount of data analysis capability. Finally, TagCentric provides a fairly intuitive and user-friendly interface.

TagCentric currently supports 4 reader types: Alien, Symbol, ThingMagic, and a "fake" reader type that will generate synthetic RFID tag data. The fake reader is useful for testing in the absence of an actual reader. In the future, we plan to add support for the Impinj reader, as well as the mobile and handheld versions of the Symbol reader.

TagCentric is compatible with the following database management systems: DB2, Derby (an embedded Java database developed by IBM), MySQL, Oracle, and PostgreSQL. Currently, tag information is collected from the readers and inserted into the database one tag at a time. Future versions of TagCentric will support bulk database inserts (to increase efficiency) and the exporting of query results to a formatted text file or a comma-separated-value file.

RFID tag printer support is also available in TagCentric. Currently, we support tag printing through the Zebra printer. We allow for up to 10 lines of text to be printed out to the tag. In the future, we plan on adding support for additional printer types, as well as the capability to print out logos to tags and allow for multiple orientations for the text/logo on the tag.

Other planned enhancements include adding an Application Level Event (ALE) server to allow for EPCIS compatibility, adding access control and security features, and adding a reliability layer on top of our UDP transport mechanism.

TagCentric was developed in Java to allow for maximum portability and is being field-tested at the RFID Research Center.

## Calculating the 'Practical' Read Rate

What are the chances of seeing each individual case somewhere along the supply chain? If one assumes that at any single point, the read rate is 90% and there are 2 read points in the DC (conveyor and outbound door) and 4 in the store (inbound door, sales floor door out, sales floor door in, box crusher), then the probability of seeing each box at least one time in the supply chain is:

$$1 - [(1-90\%) \times (1-90\%) \times (1-90\%) \times (1-90\%) \times (1-90\%) \times (1-90\%)] = 1 - [.000001] = 99.9999\%$$

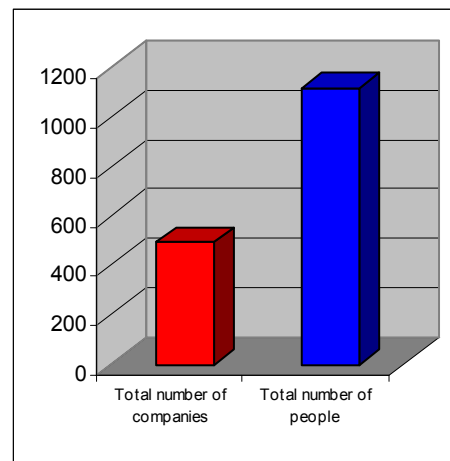
Thus, the chances of seeing the individual case somewhere in the supply chain is 'practically' 100%.

## Lab Count Update

Lab visitors as of November 1, 2006

Total number of people: 1113

Total number of companies: 493



## Tip of the Day: Getting 100% Read Rates

While most companies have the goal to set up their pallets so that they can achieve 100% read rates at any single portal in their supply chain, this may not be as vital as you might think. Accumulating 100% over different portals throughout the supply chain may serve an equivalent purpose. Say you have a pallet of product that leaves your DC with all items being tagged. For most companies, being able to see 100% of those tags when they are palletized can be difficult given the type of product (for example, those containing liquid or metal).



That is why certain retailers have asked for the use of a "pallet tag" that contains information on the quantity of the entire pallet. Making sure that your pallet tag is in an optimal location which will insure the integrity of your pallet of product. From there, your product will most likely be broken down into single cases at some time in the chain of distribution, and receiving 100% at that point, once disaggregated, will become an achievable goal.

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## *Student Profile*

The Quality Control and Cold Chain Manager of the RFID Research Center, Levi Harris, was born in Hot Springs, AR in 1984. Levi has also lived in South Africa and Connecticut. While moving Levi realized that he had developed good people skills. This led him to become a Resident Advisor for the University of Arkansas Housing Department. While working as a Resident Advisor, Levi has helped hundreds of freshmen college students acclimatize to college life, resolve personal and profes-

## RFID Lab Helps Students Get Jobs by Joseph Ray

I sat down with Nabil Kawas of H.J. Heinz, to talk about how RFID and working at the University RFID lab helped him get a job. Nabil was a graduate student through the 2005-2006 semesters, and worked as a graduate assistant at the RFID Research Center. While working there he discovered many insightful practices, and developed many relationships that helped him directly with his future. "I was helping with a lab tour for IT managers that were Wal-Mart suppliers. I was presenting one of the stations that the group managers went to. A representative from Heinz saw my presentation." As a part of the MBA program at the University, Nabil had also developed contacts inside of the company. "When the lab posted my biography and resume in their monthly RFID Reader, my name was already recognized by Heinz when I pursued them as a company to go work for." Nabil has been working for Heinz as a International Business Analyst for the past six months.

I also talked with Rudy Ledbetter, an Associate Pricing Analyst for ABF Freight Company, who was also a part of the graduate assistantship program for the RFID Lab. He also elaborated on the usefulness of the lab having a "business sponsorship" with ABF, and the value of having RFID experience. By using the university's contacts and his advisors within the transportation/logistics department at the University, it gave him the advantage he needed to get the job.

## Fact or Fiction? Tracking with RFID

RFID can be used to continuously track people/objects wherever they go ... Fact or fiction? This is fiction! Passive UHF RFID systems have a limited read range (about 10-30 feet). Because tags only emit energy within a read zone, they are not readable (and, thus, trackable) outside of the read zone. To continuously track someone/thing, you would need to set up RFID readers and antennae approximately every 10-30 feet. This would be prohibitively expensive in a large warehouse; it would simply not be feasible to do so in an open air environment (such that someone could track you from the grocery store to your house). Are you concerned about being tracked? Then you need to throw away that cell phone you are carrying ....

For more information about this RFID myth, download a copy of our paper about the myths and realities of RFID at <http://itri.uark.edu/rfid>

sional problems, and find their niche at the University of Arkansas. Levi has also worked as an Orientation Leader for the University of Arkansas. This involved teaching incoming and prospective students the traditions, the campus, and the resources that are available to them on campus; along with helping them pick classes and their schedules.

Levi's interest in analytical problem solving and design led him to pursue a degree in Mechanical Engineering. After two years of studying engineering Levi realized

that he was really more interested in the supply and management side of business. This realization prompted Levi to leave engineering and begin the pursuit of a degree in Transportation and Logistics. Levi will graduate with a Bachelor's of Science in Business Administration, majoring in Transportation and Logistics, with minors in Enterprise Resource Planning and Entrepreneurial Management in August 2007. He is outgoing, energetic, self-motivated, competitive, and team- and result-oriented with a strong background in problem solving.

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### Company RFID Training

The University of Arkansas now offers Company Training at the U of A RFID Lab. The 2-day training session is limited to 1 company per session and is designed to provide an introduction to RFID via a hands-on work with a company's product. So, bring your product and a minimum of 5 people for hands-on, company specific training. For more information contact Justin Patton at:

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For more information about becoming a sponsor of the RFID Research Center, contact:

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