The World with RFID

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Introduction

Radio Frequency Identification (RFID) is one of hottest buzz words in past few years and even getting more attention recently. The two largest "buyers" in the world, Wal-Mart and U.S. Department of Defense (DoD) mandated their suppliers to apply RFID tags on the goods shipped to them, which stimulate widely real-world implementations of RFID technologies and set the tune for the coming of era of the world with RFID. In short term, the business benefits of employing [or applying/using?] RFID technologies are not always so significant; however, the long-term road map is extremely bright. This year's US-Taiwan High-Tech Forum (UTHF 2006) was designed to explore the essential technologies required to have successful real world RFID adoptions, as well as to outline the promising outlook of RFID technologies – "The Word with RFID".

The UTHF was opened by a keynote speaker, Dr. Krish Mantripragada [1], the senior director of SAP RFID solutions. Dr. Mantripragada illustrated how RFID technologies can transform current enterprises to highly adaptive business entities. Therefore, enterprises can have more effective planning (re-planting), execution, and timely collaborate with and response to their business partners. Dr. Mantripragada pointed out that the main values of RFID adoption cover the following areas: automation business processes, good / asset track and trace, enriching existing business solution, object information service, and traceability across business processes.

Widely accepted standards are the most important key factor to have RFID solutions became worldwide adoptions from today's niche adoptions. EPCglobal is such organization (http://www.epcglobalinc.org/home) that is developing RDIF standards from hardware layers to software layer (e.g., tag protocols for RFID tags, reader protocols, filtering & collection, and EPCIS). Major RFID players from users as well as solution provider communities are actively participating EPCglobal activities and specification definitions. Here I just name a few participating companies: Wal-Mart, US DoD, Microsoft, IBM, SAP, Oracle, TI, Intel, etc.

Our second speaker, Dr. Richard Sawn [2], is the co-chair of EPCglobal EPCIS working group. Electronic Product Code Information Service (EPCIS) is the standard to define how supply chain partners exchange RFID observations. The raw RFID observations can be enriched and then described as EPCIS events (they are: object, aggregation, transaction, or quantity events). These events can be shared among the trading partners by either push or pull fashions.

Currently, the major suppliers of Wal-Mart have already used EPCIS concepts to exchange their RFID observations. One particular example is Kimberly-Clark (K&C). K&C has already used Wal-Mart's EPCIS feedbacks to significantly improve the accuracy of their proof-of-delivery. Although the expense of K&C's RFID adoption is more than millions U.S. dollars, RFID adoption has lowered reduction from Wal-Mart (due to the better proof-of-delivery) and brought extra revenues for K&C. The additional revenue generated is enough to pay for the total project expense within six months K&C plans to expand its application of RFID technology to further improve the company's sale campaign efficiency and inventory management.

Dr. Swan provided the latest insights into current EPCIS specification (which is scheduled to be ratified in the near future). He explained how to use EPCIS to enrich the raw RFID readings with relevant business contexts to answer the questions of what, when, where, and why of RFID observations.

RFID tags can usually be categorized as passive or active. Passive tags are not self-powered. However, they are less expensive to produce and can be used for massive serialization (due to their low production cost) and eliminate line-of-sight restrictions. However, passive tags have short effective read / write distance. On the other hand, active tags have their own power (by battery) and can be read / written from quite far distance away. They allow even more advanced applications beyond serialization purposes such as real-time locationing and sensor network enabling. However, they are usually quite expensive and battery life could be an issue. Mr. Richard Bravman's [3] company, Intelleflex Corporation,

is developing a new breed of RFID tag, called battery-assisted passive RFID tag (which is class 3 tag – according to the original EPC class scheme). The RFID tag is designed and built to capture the merits of both passive and active tags. The potential applications of such RFID tags include: asset management, yard management manufacturing WIP tracking, security / access control, smart part marking, and cold supply chain. Intelleflex's battery-assisted RFID tags have 50m+ operating range, and also have robust operation around metals and liquids with a relative low tag cost.

The forth UTHF speaker is Dr. Jimmy Li [4] from Taiwan. Dr. Li is the deputy director of "initiative office for government RFID applications" of Ministry of Economy Affairs of Taiwan. He gave an overview of RFID initiatives in Taiwan and presented what the ongoing projects in Taiwan are (such as RFID solutions for food supply chain tracking, hog industry farming, patient safety in hospital, and fast visa tracking & luggage security in airport). Dr. Li explained the Taiwan government's resources for supporting RFID research and adoptions. He also presented the strategies to grow RFID industry in Taiwan, which are by creating RFID market demand, stimulating innovative RFID applications, developing core RFID technology, and strengthening RFID infrastructure in Taiwan. The goal is grow Taiwan's RFID industry size to NT $70 billions by year 2013.

In the afternoon, UTHF had two parallel tracks running; Track One was with RFID hardware focus and Track Two was with software focus.

In track one, Dr. Elmer Hsu [5] illustrated how RFID Technology Center (RTC) at ITRI Taiwan facilitates the development of RFID industry in Taiwan. RTC uses a systematic approach to work with world wide RFID leading players to establish RFID technologies in Taiwan. Therefore, key components of overall RFID solution are one-by-one addressed by RTC initiated projects; such as setup an EPCglobal accredited RFID test center, the developments of 915 MHz tags and readers, 2.45 GHz readers, and EPC class 1 Gen 2 tags and handheld readers. In the next three year, RTC will focus on the following areas / technologies: printed RFID, senor-enabled RFID tags, RFID anti-counterfeit encryption, tagged object network, RFID mobile phone, SCM real-time authentication & security

control, and RFID conformance / interoperability test.

Dr. Richard Zai [6] presented how active RFID technology can be used in home-care applications. As Dr. Zai pointed out, the home-care market is a fast growing one due to the increasing of elder population. Using Zigbee (IEEE 802.1.5.4) to enable active RFID network, the RFID solutions can be built for emergency alert system and location-based service in retirement community. These solutions can enhance elder people's life standards as well as open up profound business opportunities.

The RFID hardware track was concluded by Professor Tom Lee [7] from Stanford University. Professor Lee explained the challenges in RFID design as well as the promises of RFID technology. As he noted, there is no single RFID technology can meet all requirements. For example, Class 1 Gen 1 EPC tags have been given an expectation which is set too high; while no one can earn money at $0.05 per tag. Also their read rate is less than 1000 tags / minute (now, hoping Class 1 Gen 2 tags can meet the expectation better). Professor Lee also outlined the trends of RFID tags: (1) transition from HF (13.56 MHz) to UHF (~900 MHz) for passive tags, (2) battery-assisted passive tags, and (3) WiFi-based active tags. Especially, WiFi-based active tags can be used in asset & people identification and real-time location solution (RTLS). In addition, the cost of such RFID chips can be further reduced to $1~$1.5 per chip within the next few years (e.g. the overall RFID tags cost can be around $2~$3 per tag).

In track two, there were two speakers, Keith Cotterill [8] and Thomas Odenwald [9]. Mr. Cotterill is the president and founder of Bonsai Development Corporation (BDC). He described how to use distributed RFID information network to support large scale even-collaboration. Such information network can be used to support inventory visibility, patient-drug tracking, on-demand drug information, and trade finance.

Mr. Odenwald [9] is the director of global smart item research of SAP research. He depicted advanced RFID applications beyond using RFID to identify people or object -- enable location awareness, environmental monitoring, and safety. Also with such RFID enable smart

items, business logic / intelligence can be moved to the edges of networks / IT system landscape. This changes the information system's command-and-control paradigm. He also gave an overview of SAP's smart item infrastructure, and illustrated a real world implementation of such framework at the oil refining giant, BP, for its dangerous goods and workplace safety management.

Conclusions:

The year's UTHF covered the topics of RFID technologies from different perspectives: hardware, software, and standards. The conference was designed not only for the people in RFID profession, but also for people who has no strong RFID background.

Because of the push of mandate requirements from Wal-Mart, UD DoD, and FDA pedigree regulation, the momentum of RFID adoptions have been built. As more and more RFID early adopters find the real business advantages of RFID implementation (e.g. K&C). RFID technologies are going to gradually step into our life in the future. We are going to live in "the world with RFID", the conference theme was just to reflect what will happen, and hopefully, provide the attendees some hints of great business opportunities they can go for exploring.

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References:

1. Dr. Krish Mantripragada, Program Director and Global Lead of SAP RFID Solution and Technology Strategy Management.
2. Dr. Richard Swan, CTO, T3Ci (Also EPCglobal EPCIS working group co-chair).
3. Richard Bravman, Chairman & CEO of Intelleflex Corporation.
4. Dr. Jimmy Li, Deputy Director, Initiative Office for Government RFID Applications, Ministry of Economic Affairs, Taiwan, and Advisor, IDEAS, III, Taiwan.
5. Dr. Elmer M. Hsu, VP & General Director of RFID Technology Center, ITRI, Taiwan.
6. Dr. Richard Zai, CTO, Adept Identification Technologies.
7. Dr. Thomas H. Lee, Professor of Standford University, Standford Microwave Integrated Circuits Laboratory.
8. Keith Cotterill, President and Founder of Bonsai Development Corporation (BDC) Mr. PJ McNeely, Senior Analyst, American Technology Research.
9. Thomas Odenwald, Director of SAP Research