Wireless Tags – A Smarter and Safer World?

Radio frequency identification tags, or *smart tags*, are helping to make the Ambient Intelligence vision a reality. Tag costs have fallen to Euro cent levels and will soon be found on almost every product. This creates a wealth of business opportunities, enabling more efficient supply chain management and remote monitoring of work processes and flows. Examples include warehousing, inventory management, customer-supplier information systems, product tracking, secure access control, electronic identification and electronic billing systems. The mass roll out of smart tags entails radio spectrum usage, increasing the need for world-wide standardisation that is currently lacking. On the other hand, smart tags present a threat to personal privacy, since not only can the product that carries the tag be traced, but also information about the owners can be collected and exploited. The session gathered important speakers in the field, giving the audience a chance to note the vision of these key players in this important area. "We have the technology," explained the session chair, "and the benefits are great."

Main Issues Raised

Alexander Gauby opened the session with an outline of the application opportunities presented by radio frequency identification tags. They create the bridge between the real world and the digital virtual world in computers. They automate the translation between the two, eliminating the need for human intervention in the form of data entry. They require no line of sight between tag and reader, and make bulk sensing possible. Present day applications are closed-loop (that is to say, serving one application in one company) with reusable tags, for example, the tagging of library books, animals and vehicles. Open loop applications (that is to say, serving multiple applications for different agents) will be feasible from 2007.

The use of disposable tags will support applications such as baggage handling. However, ongoing development faces a critical volume barrier. More applications would follow from cheaper technology, and cheapness from rapid take-up. He listed the active and relevant research areas: they include semiconductors, materials research, smart sensors and embedded computing. Noting that although the technology was here now, he concluded that plenty of development is needed to reap its full potential.

Lorenzo Castelli gave a lot of detailed technical information about radio frequencies, suppliers, materials, production methods and the quality control necessary to ensure 100 percent working tags. He closed with an intriguing vision of *intelligent paper*, a futuristic way of packaging tags.

Lutz Heuser explored in some depth the impact of radio frequency identification tag technology on business processes. "By connecting the corporate world to digitally enabled objects that represent their goods, services and assets, businesses can

inexpensively capture detailed information that enables a corporation to better adapt to the changing flow of its products and customer needs," he explained. Examples of support to supply chain management and supply chain event management include inventory management, shipment tracking and work-in-progress visibility.

Advice of delivery was a very valuable quality advantage for enterprises to offer to its customers. A typical future retail store might use smart tagging for tagged pallets, backroom search of cases, distribution centre processes, track-and-trace, and the employees' information portal to access data about inventory, counting, technical evaluation and exception alarm reporting. He outlined schematic processes for packing and goods release, and for goods inward receipt. Drawing attention to the potential cost savings, he closed by noting that he expected retailers in the United States to demand product tagging from all suppliers within the next few years.

Katherine Albrecht issued a strong challenge to smart tag technology on the grounds that it is chipping away at personal privacy. She noted that while some of the world's largest corporations have been developing this technology behind closed doors since 1999, a counter-balancing consumer thrust has only existed for about six months. "Plans are underway," she warned, "to tag every consumer product in the world, and radio frequency identification tags have already been hidden in products sold to consumers."

Very soon, there would be an electronic product code, the smart tag equivalent of today's universal product codes, and businesses are being placed under pressure to implement tagging. Smart tags, which are very small, are a form of *silent commerce*. They can be read without the knowledge of a person, who may not even be aware that they are carrying or wearing one. The threat to privacy only begins with this, however, since if a tag contained a unique number, it could be used to identify the individual, then link that person with bank account, credit and other data.

Retailers want this capability to target customers, and even track them the moment they enter a store. Radio frequency identification tag enabled shelves have been placed on trial, using a concealed camera to photograph purchasers. Gillette, she noted, had ordered 500 million tags for a project it had described as a *trial*. Digital videodiscs sold in the United Kingdom and United States contain radio frequency identification tags. Europe, Japan and the United States have considered or are actively considering placing them in banknotes, so removing the anonymity of cash. The Verichip, a tag the size of a grain of rice, which can be implanted beneath the skin, provides the ultimate tool to track individuals. "The message is simple," she concluded: "Now is the time to discuss the societal implications of radio frequency identification tags."

Jacques Hulshof's closing presentation provided a great deal of information about global standardisation work for radio frequency identification tags and the involved organisations. Besides radio frequencies, standards are necessary for electrical safety, human exposure to radiation, electromagnetic compatibility and interaction with medical implants. While there is plenty of activity in the main regions of the world, progress is disparate. Much more ongoing work is needed in the areas of global spectrum harmonisation, and of interference with medical implant devices. It is quite

possible for radio frequency identification tags to influence medical implants even when compliant with one of the various standards.

A lively discussion centred, unsurprisingly, on the privacy issue. The first question, however, established the motivation for the 2,500-person Verichip trial in the United States, which had been to enhance personal safety by giving a rapid linkage to medical records in the event of an accident.

Most participants in the discussion were supportive of the thrust of Katherine Albrecht's warnings. The right of individuals to control for themselves the degree of self-disclosure resonates with the European citizen's right to be able to switch off localisation capability in mobile handsets. Another added, though, that peoples' right to make themselves invisible when they wished should be subject to an override giving society the right to capture deviant behaviours.

The discussion made clear that the issues at stake are not simple ones. Specific applications will involve a reasoned trade-off, as in the example of tagging drugs, and so being able to trace them from factory batch to the patient's bedside. The complexities of vertical chain management are very high, and pilot trials must be undertaken to identify and determine the balances between safety, efficiency and personal privacy, so finding best practice.

One participant questioned whether the privacy furore was misplaced, given that tagging supplied only product and not personal identity. Would not privacy invasion depend on database integration of dubious feasibility? Katherine Albrecht remarked that even product identity alone had its problems, since identifying a bag containing one or two particular products could quite feasibly be used to track an individual, at least for a short time. Regarding integration, she reminded the audience that government authorities in the United Kingdom and United States were already seeking powers to have official access to *all* commercial data resources. The current debate is therefore critical for looking ahead to what could happen.

Conclusions and Future Directions

This was an extremely interesting and potentially worrying session. On the one hand, smart tag technology offers society significant benefits, yet there is the possibility of serious misuse that could harm individuals and society. There are actors who, as some would see it, are actively seeking to promote that misuse, while public debate on the ethical dimension has yet to be properly launched. There was a special danger that the aftermath of September 11th might unnecessarily suppress the asking of fair and right questions.

The benefits of the technology for safety, security, crime prevention, efficiency and cost savings are clear. The technology is here now, although further research must continue to refine it and make it robust and affordable enough for open-loop deployment with disposable tags.

The privacy issue is not a technology matter but a trust concern. A most important debate is needed within and between countries. Like other aspects of privacy, there is

a need for the protection of a regulated policy. An effective response might then be to add privacy and security to the list of standardisation issues that have to be tackled.

Additional Information

Session Chair:
       Erkki Liikanen, European Commission

Speakers:
       Alexander Gauby, Infineon Technologies
       Lorenzo Castelli, X-ident GmbH
       Lutz Heuser, SAP AG
       Katherine Albrecht, CASPIAN
       Jacques Hulshof, ETSI

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