

Sense and respond

Radio frequency identification (RFID) isn't ready yet for tracking documents – but it will be soon, say its proponents.



Key fobs that beep when you clap at them never fulfilled their ambition to be a must-have technology, but they did illustrate a simple maxim: an object that wants to be found is a lot easier to locate than one that does not. While it can be comparatively easy to track paper documents using barcodes and magnetic strip technologies, it can be very hard to retrieve them if they are misplaced or misfiled.

That is why radio frequency identification (RFID) technology looks extremely interesting to organisations that need to track and store important documents.

Just like novelty key fobs, when someone looks for a document bearing an RFID tag and calls out to it using a radio wave, the tag answers back to let them know where it, and the document, is. What is more, it can tell them *what* the document is.

The technology has many potential applications in documents and records management. In addition to the same benefits that older file-tracking systems such as bar codes and magnetic strips provide, RFID tags are more durable, can store more information and can be scanned as a group, while its predecessors must be scanned individually.

Bruce Hudson, an analyst at IT market research company Meta Group, argues that RFID technology has a further advantage. "[RFID tags] identify an object without needing a 'line of sight' to the tag, whereas barcodes and magnetic strips must be aligned properly for a scanner to read them," he points out. RFID tags require no specific orientation in order to be read and so can be located inside a box and still respond to the scanner. Equally, if an individual document to which an RFID tag is attached is hidden within the organisation's document stores, someone equipped with a mobile scanner can locate it.

"The main problems to be solved are around tracking, tracing and security," says Peter Jones, head of Mu Solutions at Hitachi, the division responsible for the company's RFID-based 'Mu' tracking system. "An RFID technology that provides the ability to read multiple tags could, for example, be used to scan a tagged legal case file, scan all of the tagged documents inside the file and then check the status of the file against a computer record to ensure that all required documents are present within the file."

In document tracking, a tag embedded within a document



M-iD Resources

— A white paper by researchers at Texas Instruments on RFID and its applications (including document tracking) can be downloaded at:

http://www.ti.com/tiris/docs/manuals/whtPapers/manuf_dist.pdf

— Hitachi Europe has set up a web site dedicated to its Mu RFID offerings: <http://www.hitachi-eu.com/mu/>

can be used to track it as it moves around an organisation and its various sites; 'smart' shelves in archival warehouses can link with automatic retrieval systems to provide location updates on documents; and special document storage cabinets can register every time a document is removed or inserted into the cabinet and even be surveyed remotely to check which documents are present.

With so many factors in RFID's favour, it is unsurprising that while analysts put worldwide RFID sales at around \$700 million in 2000, they project sales in 2005 will be \$2.6 billion.

But RFID technology is not new. It was first patented in 1976; Texas Instruments introduced the world's first commercial RFID tracking system in 1991; and in the past few years, several records management systems based on RFID technology or that use it in conjunction with other tracking technologies, have been commercially available, including Thax Software's Fidentity, Infolinx's Infolinx SE and FileTrail's FileTrail software.

Yet very few companies are using RFID tags to track or find their documents: Ian Keers, managing director of Cavetab – the former UK distributor of Findentity and the exclusive UK distributor of FileTrail – admits that there is not a single UK installation of Findentity or Filetrail that uses RFID tags for tracking instead of barcodes. If RFID is so beneficial, why isn't anyone using it?

High hopes

"The concept of RFID came to my attention three years ago as a possibility in records management," recalls Keers. "It requires no action by anybody – if it works properly – for transactions to be recorded. I discovered a German company called Findentity. When we publicised it, we were deluged with [expressions of] interest."

Unfortunately, that interest soon tailed off. One reason for this was the gap between customer expectation and reality. "It's one of those systems where often customer expectation instantly jumps to a level that is higher than the ability of the system to deliver," says Keers. "People are interested in it because it's state-of-the-art and high tech. The assumption is that it's magic and knows where everything is all the time. But it really isn't like that," he says.

With the passive RFID tags typically used in a records management environment (see box, *How RFID tags work*), the RFID scanner has to be within 30cm and 35cm of the tag for it to identify and locate it. As a result, Keers found himself having to disabuse potential customers of their overly optimistic assumptions. "When you're 'negative selling' – telling the customer that your system can do less than he thought – and bringing his expectations down, it's not an ideal situation," Keers points out.

Tom Pemberton, chief technology officer of US-based FileTrail, experienced similar problems when the company used its web site to market RFID technology.

"We've been pushing RFID for document management since 1999 or 2000," he recalls. "We saw the potential to leverage the passive technology and make it truly passive – have tags on everything so people didn't have to interact with their computers any more. But that's not a practicality yet, and back then it wasn't even a reality."

FileTrail, he says, tried to convince potential customers to invest in gate technology – where users are forced to walk through a gate with an RFID scanner built in – and put pictures of the gates on its web site. "That was what people understood and that's what people wanted; they'd seen how they walk through gates at the supermarket that detect if you're stealing a steak or not."

However, as the technology stood then, it could not live up to that promise. "If you had ten file folders in your hand or

ten objects that were tagged and you walked through the gates really quickly because you were on your way to a meeting, there was a really high probability that not all ten items would be read. And if you know the system isn't 100% reliable, then nobody's going to count on it," says Pemberton.

Reality bites

Nevertheless, while customer expectations of the technology have been high, RFID technology has advanced to an extent where it can meet most of these expectations or at least come close. Now the main barriers to adoption are the cost of the tags themselves and the cost of implementation.

"The problem we have with RFID," confesses Keers of Cavetab, "is the cost of the transponders, to be honest. Although people are talking about price coming down rapidly, my experience to date is that the tags are costing us about 1 each, which is horrendously expensive when you have many, many records. The breakthrough will come when they come down to a few pence."

IT market research company AMR Research also finds

price a significant issue for many companies interested in RFID technology. "Readers are still expensive," argues researcher John Fontanella, "and unless you are buying RFID tags by the hundreds of

millions, the 50¢ to 75¢ unit cost is well beyond a threshold that makes them a compelling value." Fontanella does not believe that tags costing a more palatable 5¢ will be available until 2006.

Even that price tag may not be cheap enough. "It's still not likely to make economic sense," argues David Gingell, vice president of marketing for enterprise content management software company Documentum. "Consider a confidential case file in a firm of lawyers. The file is likely to contain tens or hundreds of pieces of paper – many materials for the case and highly important. Sure, you want to know what happens to that piece of paper, so if you could tag each piece, you could track its movements," he says. But with hundreds of sheets to tag, there is the cost not just of the tags themselves but the associated work of physically tagging each sheet, he says. When barcoding systems are able to print a code onto a piece of paper at the same time as the content of the document for no extra cost, there is little incentive to switch to RFID tagging.

It is this additional implementation cost that is preventing many companies from using RFID technology. FileTrail's Pemberton says that while 50% of the company's customers have expressed an interest in the technology, the thought of having to 'retrofit' documents with tags has put off many of them. "The concept of having to go back and apply these tags to ten thousand or a hundred thousand or five million items

Peter Jones, Hitachi



"RFID can scan all the documents in a file and check against a computer record that all the required documents are present in that file."

HOW RFID WORKS

An RFID system consists of two main components that together store, transmit, and read information on identification tags attached to just about anything. On every item that needs to be monitored are 'tags' that can be electronically programmed with unique information such as an identification number. A 'reader' monitors the tags by emitting radio signals. These activate the tags so that the reader can read and write data to them.

When an RFID tag passes within range of the reader, the reader detects it, decodes the data in the tag, then sends it to a computer for processing. The reader can be continuously 'on', or it can be activated as needed by a sensor.

Low-frequency (30KHz to 500KHz) RFID systems are most frequently used for security access and asset tracking. They are inexpensive but have short ranges. The more expensive high-frequency (850MHz to 950MHz and 2.4GHz to 2.5GHz) systems are used for applications that need to operate at high speed or over ranges greater than 90 feet. Multi-frequency systems are a fairly recent development, as are systems with higher frequency ranges (up to 7GHz, with 10GHz on the horizon). This lack of standardisation can be problematic for larger organisations, particularly if they have multi-national sites, where different regulatory regimes may mean that the tags used in one site are illegal in another.

The tags themselves can be either 'active' or 'passive'. Active tags are typically read/write and are powered by an internal battery, but are suitable only for high-end applications since they are quite expensive. Passive tags don't have batteries – they operate on power drawn from a magnetic field created by the radio waves from the reader. They are much lighter than active tags and are less expensive, but they have shorter ranges than active tags and require a high-powered reader. They are the most suited to document management purposes since they can be much thinner and smaller than active tags.

Chipless tags are the cheapest solution of all since they do not have embedded microchips. Instead, reflective materials in the tag bounce radio waves back to the reader in a pattern that serves as a unique identifier of the object with the tag, somewhat like a fingerprint. This technology is potentially useful in preventing forgery or unauthorised copying of documents.

that they're currently tracking with barcodes is just completely prohibitive," he says. He believes that it will only be when the cost of getting an RFID tag onto a document falls to the same kinds of levels that are envisaged for the tags themselves that their use will take off.

Departmental dimensions

As a result, the main adopters of the technology are not larger companies with many documents that they need to track, but small law firms, human resources departments and government departments that have a sufficient number of documents that they need a system to track them, but do not have so many that the cost of adding the tags to the documents will be excessive.

A possible solution to this dilemma has come from manufacturer Hitachi. Its Mu RFID chip has an integrated antenna and measures just 16mm square, meaning it is capable of being embedded in paper, potentially at the point where the paper is being manufactured. "At the moment, it is looking like

Tom Pemberton, FileTrail



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it will add up to 5¢ to the cost of a piece of A4 paper," reveals Hitachi's Jones. "But a lot of people have this big pre-conceived notion of cost being a barrier. It's not cost but return on investment that's important. For a piece of paper that's just going to go into a photocopier, 5¢ may seem like a lot. But if you're adding it to a hundred-million dollar bond or a 500 note, it's just peanuts."

Hitachi is working with partners to try to create a viable process for embedding Mu chips into paper during the production process and Jones estimates a commercial solution is between six and 18 months away. However, the company is already in talks with a number of Japanese and European currency printers to embed the chips into high denomination yen and euro notes.

As the price of tags drops, many organisations are likely to look at RFID tags as a potential addition to their document tracking strategy, using barcodes to track older or less important documents and RFID to monitor live and valuable files, albeit at the file folder level rather than the sheet level.

But as the tags themselves become smaller and paper production processes enable the embedding of tags at source, the potential for far wider use of RFID technology, especially in the realm of document tracking systems, will increase dramatically and it will not be long before the embedded chip becomes as ubiquitous as the barcode. ■

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