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RFID Technology in the Library Environment
by Linda Howard and Max Anderson

Radio frequency identification (RFID) is one of many products falling under the umbrella name automatic identification, or auto-ID. These technologies are used to help machines identify objects. Other auto-ID technologies include barcodes, smart cards, voice recognition and optical character recognition.

RFID technology has been around for about 60 years. During World War II, the Allied Forces used it to identify friendly aircraft in an effort known as IFF (Identify Friend or Foe). In the 1980s, the technology went public and was used for everything from tracking cows and pets to triggering equipment down oil wells. The most common applications include tracking goods, assets and production-line moving parts; security, such as controlling access to buildings and networks; and automated payment systems that let customers pay for items without using cash.

Current uses of the technology suggest its flexibility in diverse situations. Dog owners have used RFID tags to identify their pets rather than the traditional tattoo. Hewlett Packard used RFID tags to track runners at the Boston Marathon. An amusement park in Denmark uses RFID technology to help parents keep track of their children while at the park. The Vatican is currently tagging its 1.6-million-volume book and manuscript collection with RFID microchips. RFID technology is used to combat counterfeiting in sports

memorabilia and to track baggage at airports.

The world's largest retailer, Wal-Mart, requested that its top 300 suppliers tag all their pallets and cases in 2005. In a similar move, Target, third largest retailer in the United States, set a 2007 deadline for its top vendors to implement RFID. The Department of Defense required its 45,000 suppliers to be tagged in 2005. Libraries are the largest institutions using item-level RFID tagging and, as such, are on the cutting edge of the developing technology for this unique application of RFID.

RFID in Libraries

RFID technology offers libraries many advantages. By enhancing efficiency in circulation and security, RFID technology frees up staff to provide increased information and intellectual support to patrons. RFID technology reduces the frequency of repetitive stress injuries, gets materials back on the shelf more quickly and provides higher levels of privacy to patrons, who can check out their own materials. Using RFID inventory systems can also save time and money.

One disadvantage is that RFID does not provide fail-safe security. RFID is certainly not worth the investment if being implemented primarily for that reason. Tags can be ripped off materials, media is a problem to tag, and readers do not always read tags on all of the materials going out of

the library. Other obstacles are the high cost of the technology, a lack of standards and privacy issues.

So what does RFID technology look like in libraries? Components of an RFID library system include tags, conversion units, readers like self-check units, automated return systems and inventory-taking equipment, security gates, and a server or docking station software.

Tags

Tags contain an antenna and a chip with a capacity of at least 64 bits that can be encoded with data the library selects. They are in the high-frequency range of 13.56 MHz and are available as WORM, read, and read/write. WORM ("write once read many times") indicates that a tag can be programmed one time only. Read tags come with preprogrammed information, usually some type of item identification, and cannot be written to. Read/write tags can be "written to" many times and are the most frequent choice for libraries. Most vendors claim a minimum of 100,000 transactions before a tag needs to be replaced.

Other tag features include antitheft and anti-collision properties. The anti-collision feature allows more than one item to be checked out or in at the same time, as opposed to barcodes, which, because they require line-of-sight for material processing, can handle only one item at a time. The antitheft feature, referred to as the

security bit, is sensitized and desensitized during the check-out/check-in process and provides a level of security for the materials.

Tags developed for libraries are passive — they do not contain batteries, and they are activated by proximity to radio waves from a reader. Tags can withstand dirt and scratches and can be scanned from distances of up to two feet. Item-level tags can cost anywhere from $.40-.85 each and represent the most costly part of the RFID system for libraries. Plastic covers for tags or bookplates may be individualized by adding the library's name or logo, which will enhance the security of the tag.

Because tags cannot be read through metal or water, tagging media like CDs and DVDs requires special solutions. Vendors approach this challenge in a variety of ways. Some offer special circular tags that fit around the inside of the diskette; these media tags can cost up to $1.50 each. Since not all CDs and DVDs are made alike, the tag may cover a portion of what is encoded on the disk. Other vendor options for media include special lockboxes with tags or a separate distribution and security system.

Conversion Units

Conversion units are used to copy barcode data to an RFID tag during the material conversion stage of the RFID installation. These units can be purchased or rented, are portable for easy movement around the library and fit in the aisles between the stacks. The type of equipment purchased will influence the conversion plan. For example, a combined self-check conversion machine could bypass a formal conversion process altogether. In one option, conversion takes place as patrons check out materials; items used frequently receive the fastest conversion. After a set period of

time, it is possible to run a report to see what remains to be tagged and to develop a staff workflow to accomplish it. Conversion units can be rented by some vendors for approximately $250 per week or purchased for $2,500 to $5,000.

Readers

Readers come in various forms. They can be handheld, mounted, freestanding (like security gates), desktop, or installed in the return bins. Many libraries currently use security systems like tattle tape with their security gates. Libraries should be aware that if RFID is being implemented for the security bit, these gates will need to be replaced. Security gates can cost $3,500-$6,000, and book-drop readers can cost around $2,500.

Self Checkout Readers

We are all accustomed to using self-service in many different environments such as the grocery store, retail establishments and ATMs, so library self-check is not a big leap for library patrons. Basically, the self checkout process desensitizes the security bit and updates the material status in the library's circulation system. Self checkout units are by far the most popular RFID solutions for libraries and provide immediate improvement in service and quality of experience for library patrons. RFID libraries report that anywhere from 40 to 90 percent of their check out has moved to self check. These units also provide patrons with a greater degree of privacy, since only the patrons handle their materials during checkout.

Self Check-In Readers

These readers check the material back into the library's catalogue and resensitize the antitheft feature. Readers for check-in can be installed as book returns throughout the library. Automated book returns have the capacity to sort returned materials into sorting bins, thereby

getting the materials back on the shelves faster. The prices of these readers, whether for check-in or checkout, can be as much as $18,000-$22,000.

Inventory-Taking Equipment

Inventory wands are handheld devices used to scan materials for library shelf maintenance including weeding, finding lost or misplaced materials and inventorying or counting the collections. Some have screens which are hard to read. Others offer a separate unit, like a PDA, that has to be held or worn on the wrist but which provides a better viewing area for the user. Scanners that work with both RFID tags and barcodes are available and desirable for use during conversion or partial conversion of the collection to RFID. Costs for inventory-taking equipment typically run from $2,500-$4,500.

Security Gates

Though RFID security gates look very similar to the standard gates many libraries already have in place, the internal technology is different. For certain RFID systems, security gates emit a sound if the material has not been properly checked out.

Servers/Docking Stations

In order to manage the communication between various components of the RFID system, a library may choose to use either a server or a docking station (the docking station involves increasing the amount of software in the readers). Basically, the server or docking station software receives communication from the reader(s) and exchanges information with the library's circulation database. Whichever way a library decides to go, the library will be using SIP2, Standard Interchange Protocol, which manages the communication between the RFID system and the library's integrated library system (ILS). The server can be a very expensive part of the solution, often

costing as much as $15,000 with much of this cost being the software. Keep in mind that the costs for the various parts of the RFID solution are coming down gradually. Check with vendors to get accurate pricing.

Standards

The International Organization for Standardization (ISO) is the organization that sets the technical operating standards for how readers and tags communicate. ISO 18000-3 tags, developed specifically for item-level tagging, have recently entered the marketplace. This standard establishes RFID-specific communication protocols at 13.56 MHz. The standards for these tags improve the ability to read a variety of vendor tags with one reader. However, since vendors can customize their tags by adding proprietary protocols that limit interoperability of RFID systems, libraries that interact frequently with each other are advised to jointly select the RFID system that meets their needs. For the present, that is the only way to ensure interoperability between institutions.

Privacy

Privacy advocates voice concerns that RFID technology will allow for uncontrolled snooping, like satellite tracking of library patrons and the materials they check out. Some fears of snooping are based on the belief that the tags on library materials contain patron information. Privacy advocates recommend that only information on the barcode be programmed to the tag. The link between the borrower and the borrowed material is maintained in the circulation module of the automated library system, and it is broken when the material is returned. However, if libraries implement smart cards (RFID chips on patron cards), then the privacy of cardholders could be at greater risk for compromise.

Others fear that RFID tags can be scanned outside the library

environment. Though multitag readers are a technological possibility, so far none has been developed expressly for the library marketplace. Yet, as David Molnar pointed out at a recent ALA program on RFID, current readers can be programmed to read specific tags. This requires placing the readers in locations where they will gather effective information. Even if tags contain only the barcode number, snoopers can hotlist or put together a list of barcodes and titles they are looking for.

Molnar suggests that the best way to protect patrons currently is to encrypt and password the data on the tag. He suggests that libraries understand exactly what kind of encrypting the vendor will provide. For more on Molnar's perspective on privacy, see Molnar and Wagner's paper, "Privacy and Security in Library RFID — Issues, Practices and Architectures." Tags may contain a static identifier that is burned on at the time of manufacture; according to some, this persistent identifier enables tracking via hotlisting.

Several organizations are involved in raising awareness of the privacy issues around RFID including the ACLU, Electronic Frontier Foundation, Center for Democracy and Technology, and ALA. The attached bibliography contains references that discuss the various positions of the advocates around privacy issues.

Libraries should be proactive about privacy issues by educating the communities they serve. Adopting a privacy policy that is posted in the library is one way to keep your patrons aware of the steps you are taking to protect their rights. Two good sources to consult for guidelines on the privacy issues and policies for your library are Berkeley Public Library's "Best Practices for RFID" and "Guidelines for Using RFID Tags in Ontario Public Libraries."

Getting Started

Implementing an RFID system requires assessing a library's processes and targeting those processes where RFID would be appropriate. Lists of questions to guide the assessment process have already been developed. (See Laura Smart's "Making Sense of RFID" in the bibliography following this article.) Another approach is to take a look at the processes in your library from the patron's point of view. To the patron, everything in the library is pretty much centralized, i.e., all activities go through the front desk. According to Kern and Nauer in their article, "Implementing RFID in Libraries for Process Automation," RFID systems allow the library to decentralize processes so that reconfiguring the physical space of the library may be an option to consider. This article provides suggestions about space reallocation based on an RFID system being in place.

Nine Issues for Librarians To Consider About RFID

1. Workflow issues surrounding the technology. Do you need that $200,000 book sorter? Do you need this technology? Follow the life of a book, for example, and compare it to the pieces of RFID technology. What pieces do you feel would make it easier to handle the material?

2. Cost of tags. Just because Wal-Mart and the Department of Defense are requiring their vendors to use RFID tags does not mean the cost for library tags will come down; they are most likely on a different frequency, which makes it a different type of tag.

3. Barcodes or no barcodes? Libraries need to consider whether they are going to take out all of their barcodes once they convert to RFID. Remember that without a barcode number on an item, you are depending on your RFID system to correctly identify it. Some vendors now incorporate barcode numbers into bookplates which cover the RFID tag.

4. What sort of information are you going to keep on the tag? Potentially, the more information you store on the tag, the longer it will take to transmit the data. To help allay fears about privacy concerns, ask vendors about data encryption.

5. How are you going to determine return on investment (ROI)? Does the RFID system in which you are investing fit with the long-term goals for your institution? In addition to the cost of the RFID system, consider the costs of software, hardware, overhead and salaries while converting (some of your staff may have to be pulled from normal duties to do conversion). A year after implementation, look at staff productivity. Has it gone up? Has it gone down? Check out the ROI laundry list from Laura Smart's "Making Sense of RFID."

6. Privacy issues for patrons and staff. Are you going to incorporate tags on library cards for patrons? Most libraries have chosen not to do this. Make sure you communicate with both patrons and staff about the privacy policies of the library and how information is to be used. You may need to explain how RFID works and what type of information will be stored on the tags. Will you incorporate encryption of data?

7. Are you going to use the RFID system as a security measure as well? When asked whether it would be easier to gut the security gates and replace the technology inside or to replace the gates altogether, most vendors agree that replacing them altogether is less expensive.

8. Confirm with the vendor that your library systems and RFID systems will work together smoothly. All RFID vendors comply with the SIP2 protocol, which allows your ILS (integrated library system) and the RFID system to communicate; however it might need some tweaking. Equipment will need to be maintained after installation. As standards change, hardware and software may need upgrading.

9. Where are you going to get the money for the technology? Since this technology can be expensive, whom must you convince that this is the right direction for your library, and how are you going to do that?

Conclusion

RFID is a technology that offers many advantages to the library by creating time-saving process management efficiencies, thus enabling staff to provide more value-added services to patrons. RFID also provides the patron with self-service check-in and checkout options. According to Jim Lichtenberg, another speaker at last year's ALA RFID panel, RFID stands with other cutting-edge technologies being developed in nanotechnology and biotechnology. And these advances are not going away; they are only going to get more prevalent in our lives. We are probably in the early adapter stage of RFID in libraries, with many of the kinks and issues still to be worked out. But for Lichtenberg, like many others, it's not if, but when. Only when the major issues of privacy and security are addressed by both librarians and vendors will solutions be found. ⮞⮞

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