Use of RFID Technology in Libraries

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Abstract

RFID (Radio Frequency Identification) technology is proven to be a promising alternative in relieving the library staff from time consuming routines. RFID is an innovative automated library system for automatic identification and tracking of library materials. RFID technology is helpful in taking inventory, finding missing items and identifying misfiled items. This papers deal with the Electronic Security System is one of the fasted growing and most beneficial technology being adopted by academic library for increasing efficiency and improving the safety, security, productivity, accuracy and convenience. This paper gives brief idea about the emerging radio frequency identification technology, its importance in the library system and its working. Its also describes about the basic and optional component.

KEYWORDS: RFID (Radio Frequency Identification), Automatic Identification Technology, Smart RFID labels, RFID Tag, Security Systems, Electronic Security System, Smart library.

1.   INTRODUCTION

RFID is a subset of a group of technologies, often referred to as automatic identification, that are used to help machines identify objects, and which include bar codes and smart cards. RFID refers to the subset of automatic identification that uses radio waves to automatically identify bulk or individual items.

In recent years, radio frequency identification technology has moved from obscurity into mainstream applications that help speed the handling of manufactured goods and materials. RFID enables identification from a distance, and unlike earlier bar-code technology, it does so without requiring a line of sight. In this paper, the author introduces the principles of RFID, discusses its primary technologies and applications, and reviews the challenges organizations will face in deploying this technology.

2.   WHAT IS RFID?

RFID is the reading of physical tags on single products, cases, pallets, or re-usable containers which emit radio signals to be picked up by reader devices. These devices and software must be supported by a sophisticated software architecture that enables the collection and distribution of location-based information in near real time. The complete RFID picture combines the technology of the tags and readers with access to global standardized databases, ensuring real time access to up to date information

about relevant products at any point in the supply chain.

RFID technologies are grouped under the more generic Automatic Identification (Auto-ID) technologies. Examples of other Auto-ID technologies include Smartcards and Barcodes. RFID is often positioned as next generation bar coding because of its obvious advantages over barcodes.

3.   OBJECTIVES OF THE STUDY

    a.   To find out benefits of RFID for Libraries
    b.   To find out advantages & Disadvantages of RFID
    c.   To find out role of Librarians for adopted RFID in Libraries
    d.   To find out Impact of RFID technologies on Libraries

4.   RESEARCH METHODOLOGY

Surveys research is widely used in the both of natural science and social science from physics biology to sociology and journalism for the present study Survey research method is used. In a survey to obtain more detailed information from libraries about the process of implementation; the costs associated with it, the goals of implementation, the on-going costs, the benefits, detriments and cost savings Derived from the use of RFID systems.

5.   RFID TECHNOLOGY IN LIBRARIES

The concept of RFID can be simplified to that of an electronic barcode and can be used to identify, track, sort or detect library holdings at the circulation desk and in the daily stock maintenance. This system, consist of smart RFID labels, hardware and software, provides libraries with more effective way of managing their collections while providing greater customer service to their patrons.

The information contained on microchips in the tags affixed to library materials is read using radio frequency technology regardless of item orientation or alignment. It provides a contact less data link, without need for line of sight.

RFID-based systems have been implemented for efficient document tracking purpose through out the libraries that combine, easier and faster charging and discharging of documents, security of materials, inventorying, stock verification and shelf handling. RFID tag's transponder listens for a radio query from the reader and responds by transmitting their unique ID code. Most RFID tags have no batteries; they use the power from the initial radio.

Figure No. 5.1   Library RFID Management System

6.   DIFFERENT TYPES OF RFID
Three primary frequency bands are being used for

6.1   Low Frequency (125 / 134 KHz) – Most commonly used for access control, animal tracking and asset tracking.

6.2   High Frequency (13.56 MHz) – Used where medium data rate and read ranges up to about 1.5 meters are acceptable. This frequency also has the advantage of not being susceptible to interference from the presence of water or metals.

6.3   Ultra High Frequency (850 to 950 MHz) – offer the longest read ranges of up to approximately 3 meters and high reading speeds.

7.   RFID SYSTEM COMPONENTS AND THEIR EFFECTS IN LIBRARIES
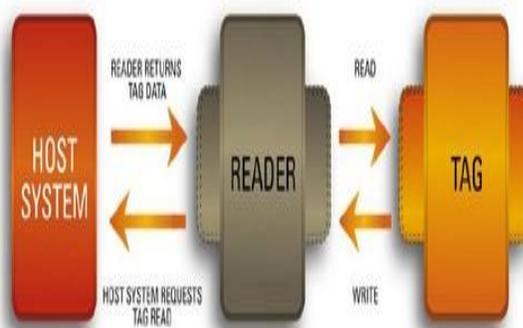An RFID system consists of following

Figure No. 7.1   Library RFID Management System

7.1   Tag
Also known as a *transponder*, the tag consists of an antenna and silicon chip encapsulated in glass or plastic. The tags contain a very small amount of information. For example, many tags contain only a bar code number and security bit (128 bits) but some tags contain as much as 1,024 bits. Tags range in size from the size of a grain of rice to two inch squares depending on their application. Researchers are now working on tags as small as a speck of dust.

Tags can be passive, active or semi-active. An active tag contains some type of power source on the tag, whereas the passive tags rely on the radio signal sent by the reader for power. Most RFID applications today utilize passive tags because they are so much cheaper to manufacture. However, the lack of power poses significant restrictions on the tag's ability to perform computations and communicate with the reader. It must be within Semi-active tags are not yet commercially available but will use a battery to run the microchip's circuitry but not to communicate with the reader. Semi-active tags rely on capacitive coupling and carbon ink for the antennas rather than the traditional inductive coupling and silver or aluminum antenna used in passive tags.

Tags operate over a range of frequencies. Passive tags can be low frequency (LF) or high frequency (HF). LF tags operate at 125 KHz, are relatively expensive, and have a low read range (less than 0.5 meters). HF tags operate at 13.56 MHz, have a longer read range (approximately 1 meter) and are less expensive that LF tags. Most library applications use HF tags.

Tags can be Read Only (RO), Write Once Read Many (WORM) or Read Write (RW). RO tags are preprogrammed with a unique number like a serial number (or perhaps eventually an ISBN number). WORM tags are preprogrammed but additional information can be added if space permits. RW tags can be updated dynamically. Sometimes space on the RW tags is locked where permanent data is kept and the rest of the tag is writable. Most library applications use RW tags.

7.2   Readers

RFID readers or receivers are composed of a radio frequency module, a control unit and an antenna to interrogate electronic tags via radio frequency (RF) communication. The reader powers an antenna to generate an RF field. When a tag passes through the field, the information stored on the chip in the tag is interpreted by the reader and sent to the server, which, in turn, communicates with the integrated library system when the RFID system is interfaced with it.

RFID exit gate sensors (readers) at exits are basically two types. One type reads the information on the tag(s) going by and communicates that information to a server. The server, after checking the circulation database, turns on an alarm if the material is not properly checked out. Another type relies on a "theft" byte in the tag that is turned on or off to show that the item has been charged or not, making it unnecessary to communicate with the circulation database.

Readers in library RFID systems are used in the following eight ways
◈ Conversion station – Where library data is written to the tags
◈ Staff workstation at circulation – Used to check-in and check-out materials
◈ Patron self check-out station – Used to check-out books without staff assistance
◈ Exit sensors – Verify that all books leaving the library have been checked out
◈ 5. Patron self check-in station – Used to check in books   without staff assistance
◈ Bookdrop reader – Checks in books when patrons drop them in the bookdrop
◈ Sorter – Automated system for returning books to proper area of library
◈ Portable reader – Hand-held reader for inventorying and verifying that items are shelved correctly.

7.3   Antenna

The antenna produces radio signals to activate the tag and read and write data to it. Antennas are the channels between the tag and the reader, which controls the system's data acquisitions and communication. The electromagnetic field produced by an antenna can be constantly present when multiple tags are expected continually. Antennas can be built into a doorframe to receive tag data from person's things passing through the door.

7.4   Server

The server is the heart of some comprehensive RFID systems. It is the communications gateway among the various components. It receives the information from one or more of the readers and exchanges information with the circulation database. Its software includes the SIP/SIP2 (Session Initiation Protocol), APIs (Applications Programming Interface) NCIP or SLNP necessary to interface it with the integrated library software. The server typically includes a transaction database so that reports can be produced.

8.   ROLE OF LIBRARIANS

RFID technology introduces an ethical dilemma for librarians. The technology allows for greatly improved services for patrons especially in the area of self-checkout, it allows for more efficient use of professional staff, and may reduce repetitive stress injuries for library workers. And yet, the technology introduces the threat of hot listing and tracking library patrons. Librarians have taken extra steps to ensure that laws such as the USA PATRIOT Act cannot be used by government entities to invade the privacy of their patrons, and yet many of those same libraries are placing traceable chips on their patron's books.

Libraries have traditionally acted to protect and defend the privacy of their patrons and yet some are implementing a technology before proper safeguards have been developed. Library use of RFID technology serves to legitimize the technology in the eyes of the community. Therefore, it is incumbent on the library community to ensure that the technology is developed in concert with established privacy principles and that any library use of RFID follows best practices guidelines consistent with library values.

9.   WORKING OF RFID

Figure No. 9.1   Diagram of RFID Working Process

10.   ADVANTAGES OF RFID FOR LIBRARIES

◆ RFID tags replace both the bar code and traditional security systems and creating a "smart library".
◆ Check-out stations can be automated with easy, intuitive interfaces, since several items in a pile canbe "grabbed" at a time;
◆ Book returns can be automated with check-in and database updates completed simultaneously in the book return chute.
◆ Fast and convenient on-the-shelf inventory allows accuracy in collection management;
◆ Automatic book sorting.
◆ Reduce material handling time.
◆ Do more frequent and accurate inventory to better manage collections?
◆ Improve ergonomics of the repetitive tasks of librarians.
◆ Improve customer service.

11.   DISADVANTAGES OF RFID SYSTEMS

11.1   High cost The major disadvantage of RFID technology is its cost. While the readers and gate sensors used to read the information typically cost.

11.2   Accessibility to compromise It is possible to compromise an RFID system by wrapping the protected material in two to three layers of ordinary household foil to block the radio signal. It is also possible to compromise an RFID system by placing two items against one another so that one tag overlays another. That may cancel out the signals. This requires knowledge of the technology and careful alignment.

11.3   Removal of exposed tags RFID tags are typically affixed to the inside back cover and are exposed for removal. This means that there would be problems when users become more familiar with the role of the tags. In Indian libraries, it is a major challenge to keep the tags intact.

11.4   Exit gate sensor (Reader) problems. While the short-range readers used for circulation charge and discharge and inventorying appear to read the tags 100 percent of the time, the performance of the exit gate sensors is more problematic. They always don't read tags at up to twice the distance of the other readers. There is no library that has done a before and after inventory to determine the loss rate when RFID is used for

11.5   User Privacy Concerns. Privacy concerns associated with item-level tagging is another significant barrier to library use of RFID tags. The problem with today's library RFID system is that the tags contain static information that can be relatively easily read by unauthorized tag readers. This allows for privacy issues described as "tracking" and

11.6   Lack of Standard. The tags used by library RFID vendors are not compatible even when they conform to the same standards because the current standards only seek electronic compatibility between tags and readers. The pattern of encoding information and the software that processes the information differs from vendor to vendor; therefore, a change from one vendor's system to the other would require retagging all items or modifying the software.

12.   CONCLUSION

RFID technology promises to change our world. It has the capability of making our personal lives and our work lives in the library more convenient. However, every new technology comes at a

cost. In order to remediate those costs, efforts must be undertaken to guide its development and implementation. Libraries should not yet implement RFID systems.

Libraries that choose to implement RFID technologies in advance of policy safeguards being put in place should take extra precautions to follow evolving best practices guidelines. Libraries should continue to protect privacy by ensuring that they are not seen as proponents of RFID before it can be safely deployed. Libraries should work to ensure that RFID products are manufactured and used according to well-established privacy principles. Libraries should refuse to implement potentially unsafe RFID solutions simply finally, libraries must be outspoken in their public education efforts related to RFID. Not only are libraries one of many industries who can benefit from the safe implementation of RFID systems, but also because RFID represents the start of a slippery slope to ever greater loss of control over our personal information.

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