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RFID in Libraries

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Overview

1. RFID and How It Works
2. Attributes
3. Components
4. Applications for Libraries
5. Benefits
6. Vendors
7. Libraries Using RFID
8. Current Problems
   - Costs
   - Standardization
   - Data Protection / Privacy Rights

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RFID and How It Works (1)

RFID = **R**adio **F**requency **Id**entification

RFID-systems generally consist of

- transponder at the object that has to be identified ➔ in libraries RFID-label in/at the media item
- scanner at location, where identification takes place ➔ in libraries e.g. the circulation desk

RFID-labels

- consist of
  - chip (contains information about the media item)
  - antenna
  - thin layers (foil, paper etc.)

RFID And How It Works (2)

RFID-labels

- are passive, i.e.
  - they don‘t have their own battery
  - energy and data transmission is only possible within a scanning field (electro-magnetic waves)
- transmit their data to a scanner on a frequency of 13,56 MHz and simultaneously get energy by inductive coupling

Valid standards for transmission of data

- ISO 15693
- ISO 18000-3 (currently in final draft stage)

RFID and How It Works (3)

Media Identification in Libraries

- exact identification of every physical unit as media item
- identification by an unique number (item number)
- item number is machine readable on a data carrier that is affixed to the media item ➔ nowadays a label is used
- machine readable data carriers: OCR-character, barcode (both used since approx. 1968) or RFID-label (used since 1998)

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Attributes

Anti Collision Function

- scanner is able to read simultaneously more than one transponder

Changeability of Data

- data can be changed
- regulation by a vendor-dependent data format

Data Transmission from Distance

- no direct line-of-sight needed
- transmission through non-metallic material is possible

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Components (1)

Scanners can be subdivided according to the range of their scanning fields into

- scanners with large range (approx. 45 cm)
  - two or more parallel lined up antennas
  - application: entrance/exit gate for theft detection
- scanners with medium range (approx. 30 cm)
  - flat antenna of laptop-size
  - application: staff and self service stations, returning machines, sorting machines, book processing station
- scanners with short range (approx. 10 cm)
  - mobile scanner, often plugged to a PDA
  - application: inventory

Components (2)

RFID-labels

- can be affixed to nearly all types of library material
- special labels for CDs and DVDs
- are the most expensive component of a RFID-system (in comparison to barcodes)
- have chips with actually 7.000 bit capacity

Application Server and Library Software

- Data interchange with TCP/IP-based protocol (SIP2, SLNP, NCIP)
  - directly ➔ library software
  - indirectly ➔ application server

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Applications for Libraries (1)

Circulation

- core application, especially self service stations
- several items can be processed simultaneously (stack processing)
- no positioning or opening necessary (multimedia-packages)
- lending of the item is written to the user account and the securing bit on the chip is deactivated
- self processing of nearly all types of media for patrons
- additional check-in possibilities (24-hour-check-in stations, often with sorting machines)

Applications for Libraries (2)

Theft Detection

- normally separated elements for media identification and theft protection integrated in just one label
- securing bit on the chip can be de-/activated
- entrance/exit gate works like a normal, well-known EM exit gate
- RFID-system can register which items have been stolen
- But: “there never has been and never will be an impregnable or unbeatable security tag – the beast does not exist” [Source: Smith (1999), p. 48]

Applications for Libraries (3)

Inventory

- items can remain in the bookshelf during inventory
- mobile scanner registers every media item
- comparison in-time or afterwards with library database gives information about
  - missing,
  - wrong placed or
  - incorrectly checked-in media items.
- impossible repair control of media items

Applications for Libraries (4)

Intelligent Shelf / Smart Shelf

- Nedap Intelligent Book Shelf
  - "allow[s] you to monitor articles taken out of, or placed back on the shelf on a (central) monitor the minute they are taken or returned!" [Source: Nedap (2004)]
  - "you are able to see what articles are often lent out, and what articles are not" [Source: see above]
- Vatican Library
  - „the shelf has its own RFID-transponder that contains a list of all books that should be placed on one board" [translated from Heise-Newsticker (2004)]

Applications for Libraries (5)

Contact-less Chip Card as Library Card

- University of Göttingen (Germany): from the winter semester 2004/05 as student identity and library card

Book Transportation System

- transponders affixed to transport bins
- new building of the main library of the Technische Universität Berlin (Technical University)
  - June 2004: technical acceptance
  - October 2004: test operation, full operation planned from beginning of the winter semester

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Benefits

- faster circulation processes
- nearly no queues at the circulation desk
- additional check-in possibilities by check-in stations and sorting machines
- less routine work for the staff
- possibility for a periodical and easy practicable inventory

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Vendors

Theft detection with on/off-mode

- Bibliotheca RFID Library Systems (Switzerland) and ekz.bibliotheksservice (Germany)
- TAGSYS (France) and VTLS (USA)
- ST LogiTrack (Singapore)

Theft detection without on/off-mode

- 3M (USA)
  - theft detection by Tattle Tape (name of the magnetic stripe)
  - February 2004: the „One-Tag RFID System“ without Tattle Tape is introduced
- Checkpoint Systems (USA)
  - chip isn’t re-writeable, i.e. without securing bit, securing by passing-by method

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Libraries Using RFID (1)

Examination of

- Stadtbibliothek Siegburg GmbH (Germany)
- Public Libraries in Singapore
- University of Las Vegas Library (USA)
- Stadtbibliothek Winterthur (Switzerland)
- Städtische Büchereien Vienna (Austria)
- Stadtbücherei Stuttgart (Germany)

(Stadtbibliothek, Städtische Büchereien, Stadtbücherei = Public Library)

Libraries Using RFID (2)

Reasons for Buying a RFID-system

- the introduction of a media securing system was originally planned
- to manage a frequent use by patrons
- possibility for introduction of self service stations
- reduction of labor intensive work for the staff
- getting the circulation process faster
- new building with larger floor space in comparison to old building but not more staff than before
- planning of a new building with a high grade of automation

Libraries Using RFID (3)

Libraries in this European cities are using RFID (altogether 57)

Austria: Vienna
Belgium: Gent, Leuven
Denmark: Aarhus, Silkeborg
France: Lyon
Germany: Bad Homburg, Bergheim, Berlin, Bonn, Chemnitz, Dresden, Frankfurt/Main, Hilden, Krefeld, Kronberg, Mittweida, Plauen, Rostock, Siegburg, St. Augustin, Stuttgart
Italy: Cologno, Cosenza, Cremona, Florence, Gorizia, Milan, Modena, Padua, Pavia, Rome, Sassari
The Netherlands: Doetinchem, Eindhoven, Heiloo, Hoogezand, Utrecht
Spain: Cadiz
Sweden: Stockholm
Switzerland: Baar, Frauenfeld, Rotkreuz, Winterhur, Zurich
UK: Cambridge, Colchester, Glasgow, Lancashire, Leeds, Nottingham, Oxford
Vatican

Other Countries (selection)

USA, Singapore
Australia, India, Israel, Japan, Macau, New Zealand

[Source for Europe: Kandel (2004)]

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Current Problems (1)

Costs

- the costs for scanners and their operation are comparable to the costs of the barcode
- new costs for mobile scanners
- RFID-labels are expensive (prices are from 2001)
  - RFID-label: ~ US-$0.60 – US-$0.90
  - barcode: ~ US-$0.01 – US-$0.025
  - magnetic strip: ~ US-$0,10 – US-$0,22
- in spite of an expected price reduction, a RFID-label won't reach the price level of a barcode label

Costs should always be seen in relation to benefits that are only made possible by new technology.

Current Problems (2)

Standardization

- ISO 15693 = independence on chip vendors
- library is dependent on the vendor of its RFID-system because of the data format
- different data formats
  - only item number and securing bit
  - additional data like e.g. signature or location
  - risk of storing unnecessary data like e.g. personal data of patrons
- possible solution
  - standardized data format
  - software that understands all used data formats

Current Problems (3)

Data protection / Privacy rights

Critics say: „insecure RFID tags will permit inventorying of people's possessions and tracking of people via their possessions. These risks are especially great where books [...] are concerned, because both privacy and freedom of expression are at stake." [Source: Electronic Frontier Foundation (2003)]

Possible solutions for libraries

- to store a minimum of data on the chip
- no personal data of patrons on the chip
- data encoding: the chip should only be readable with the scanner in the library, where the item originally belongs to

Thanks for listening!!!

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