The Skinny on….
RFID and Automated Materials Handling in Libraries

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February 4, 2014

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Why we are here

- Library is planning and designing new libraries and looking at service model changes
- Can RFID or AMH help support those changes?
- And if so, what do we need to know?

Define Terms

- RFID – Radio Frequency Identification
- AMH - Automated Materials Handling
  - Smart bookdrop
  - Automated (self) check-in
  - Library sorter
  - Central sorter

Implementing RFID

- All circulating material is tagged
- Security gates are replaced
- Self-checks replaced or upgraded to RFID
- Staff workstations get RFID readers

Implementing AMH

Don't have to leap all at once:

- Put in as part of new building project or remodel, or

- Selectively roll-out at branches based on volume, space, staffing, etc, or

- Put in central sorter at Operations center only

AMH DOESN'T REQUIRE RFID

AMH with Barcodes

- Items have to be inserted barcode up, so scanner can read them, or

- Employ top <u>and</u> bottom scanners, which costs more, or

- Have sorter reposition items, which costs more and takes up more space.

AMH with RFID

- Items can be inserted any which way

- Avoids problem of smudged barcodes

- Security switched at same time so a more compact system overall

- Provides benefit of verifying that right disc is inside case for single disc media items

- Provides benefit of recognizing when last disc is missing from multipart sets

Let's get a little into the weeds….

UNDERSTANDING RFID

Two Primary Components

1. ## RFID Tag
   - aka "transponder"
   - composed of
     - substrate
     - chip
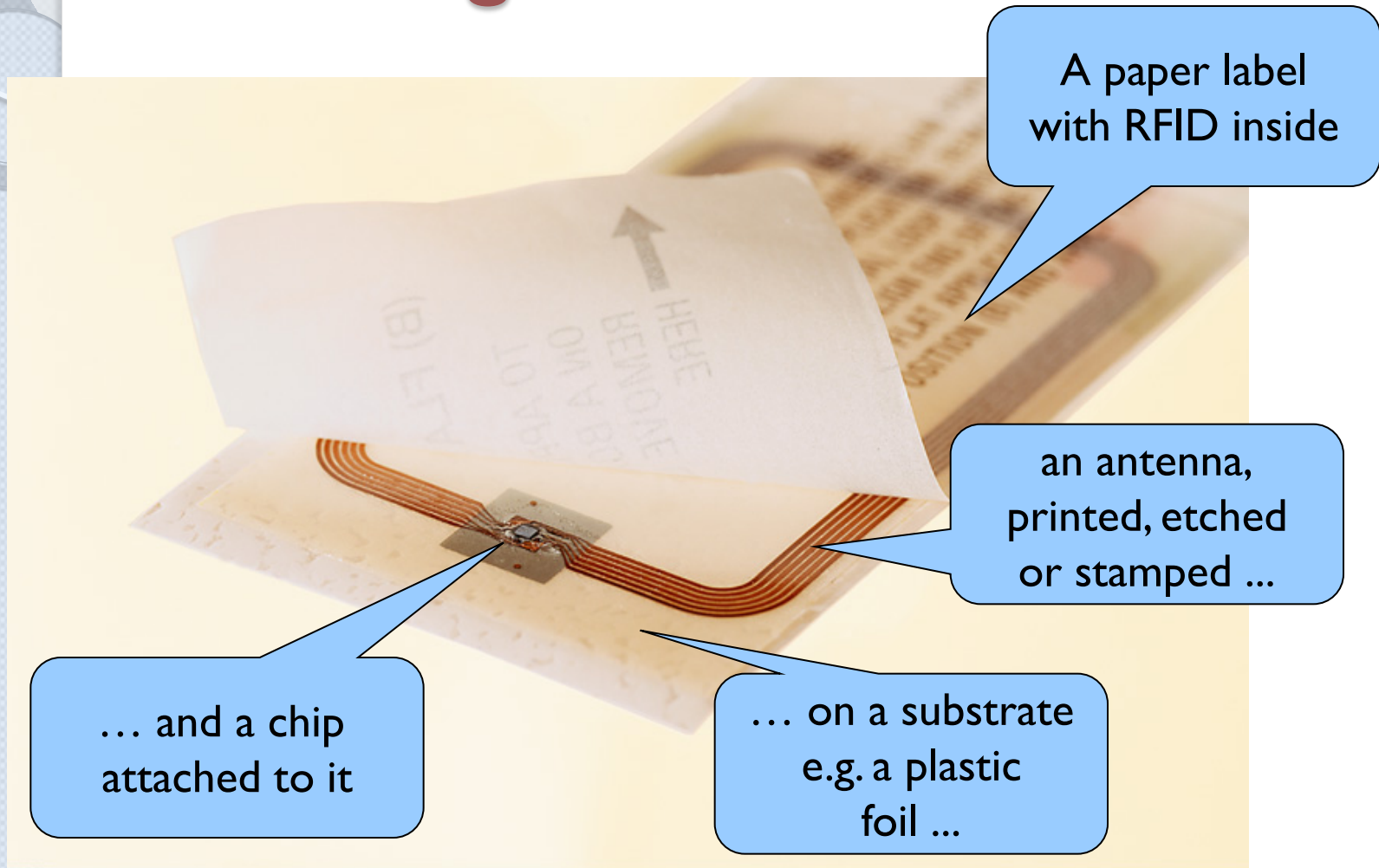   - antenna

2. ## RFID Reader
   - aka "interrogator"
   - built into
     - security gates
     - staff workstation pads
     - handheld readers
     - self-checks
     - sorters
     - etc

RFID Tag

Types of Tags

RFID Tags	Low Frequency (LF)	High Frequency (HF)	Ultra High Frequency (UHF)
Frequency	125 kHz	13.56MHz	400 MHz to 1GHz
Operating Distance	30 cm to 1 meter	10 cm to 1 meter	Passive: up to 25 meters Active: up to 100 meters
Characteristics	Short read range and read range is easier to control. Handle metal and water better than UHF. Can be affected by industrial noise. Slower data transfer rate. Cannot always communicate with multiple tags.	Short read range (especially NFC tags). Read range is easier to control than UHF. Not as effective as LF in presence of metal and water but better than UHF. Unaffected by industrial noise. Can communicate with multiple tags simultaneously.	Long read range. Fast reading of multiple tags. Less tag memory than HF. Poor performance around liquids and metals. Operate in a crowded frequency.
Applications		Library materials management and security, access control, banking cards, contactless payment systems, goods control, security.	Asset tracking, supply chain, logistics, tool booths, real-time locating systems, container security, library material management and security (limited)

Libraries use Passive HF Tags

- Passive
  - Unpowered
  - Rely on the reader to generate power to transmit data on tag
- HF
  - High Frequency (13.56 MHz)
  - Current standard applies only to HF tags

Types of *Library* RFID Tags

Form Factor/Name	Used for	
Square Tags	Books, Media Cases, Periodicals, Kits	Multiple manufacturers
Credit Card Tags / 3M ISO RFID Tag	Books, Media Cases, Periodicals, Kits	Multiple manufacturers 3M has their own version with modified antenna
Donut/Hub Tags	CDs, DVDs, BluRay	Multiple manufacturers
Full Coverage Media / Stingray	CDs, DVDs, BluRay	SMARTRAC Stingray FCI Smartag X-Range
SmartLabel 500	Laptops, iPads, eReaders, etc	Bibliotheca

Storing Data on the Tag

- Some libraries store only a barcode number on tag
- Since adoption of US Data Model, many use "Set Info" and "Owner Institution"
- US Data Model supports over 25 elements

RFID AND SECURITY

RFID Security Gates

- Security gates must be replaced since EM is based on completely different technology
- RFID-based gates read tag data to determine if items are properly checked out, three options

RFID Security Options

1. Application Family Interface (AFI)
   - ISO 28560 compliant
   - Switches between 2 (usually) statuses:
     - "circulating library material"
     - "non-circulating library material"
   - Prevents library tags from being read in non-library environments
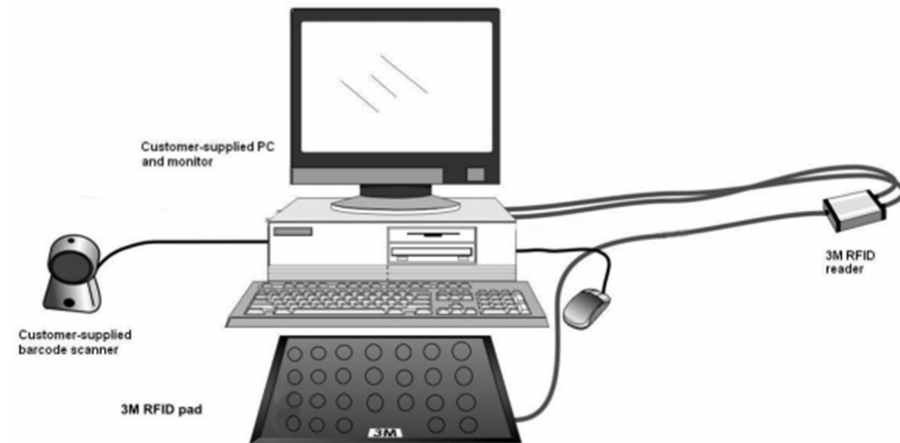2. Electronic Article Surveillance
3. Database look-up

RFID STAFF WORKSTATIONS

How Many Staff Workstations?

- Only need to retrofit workstations that change security status of items:
  - Circulation desk
  - Technical Services
- Barcodes and barcode scanner can still be used to pull up items in ILS
- Typically need only 3-5 staff workstations converted to RFID per location

RFID Staff Workstation Components

- RFID pad (antenn
- RFID reader
- Software

Customer-supplied PC and monitor

Customer-supplied barcode scanner

3M RFID pad

3M RFID reader

Staff Workstation Software

- Two options not ideal
  - RFID Reader acts like Barcode Scanner, or
  - RFID / ILS provide proprietary solution
- Very important to demo during procurement

RFID and Self Service

RFID rarely implemented without making bigger commitment to self-service

RFID AND SELF CHECK-OUT

RFID Can Increase Self-Check if Implemented Properly

- Patrons need help transitioning to RFID
  - check-out and security are two steps, but
  - easy for patrons to skip second step
- Must tag EVERYTHING that circulates

Converting Self-Check Out Machines

- Most self-check machines can be easily converted to RFID
- Just a matter of adding an RFID pad to existing system
- 3M's V-Series might need a wedgie

The standard: 3M V-Series

Self Check Table Tops

Self Check Kiosks

Bibliotheca SmartServe 400

Bibliotheca SmartServe 400 Payment

- *Attached* to their new self check-out machine
- Accepts credit cards, debit cards, and cash

Tech-Logic CircIT Combo Station

- Option for 2 screens
- Designed for use at service desk
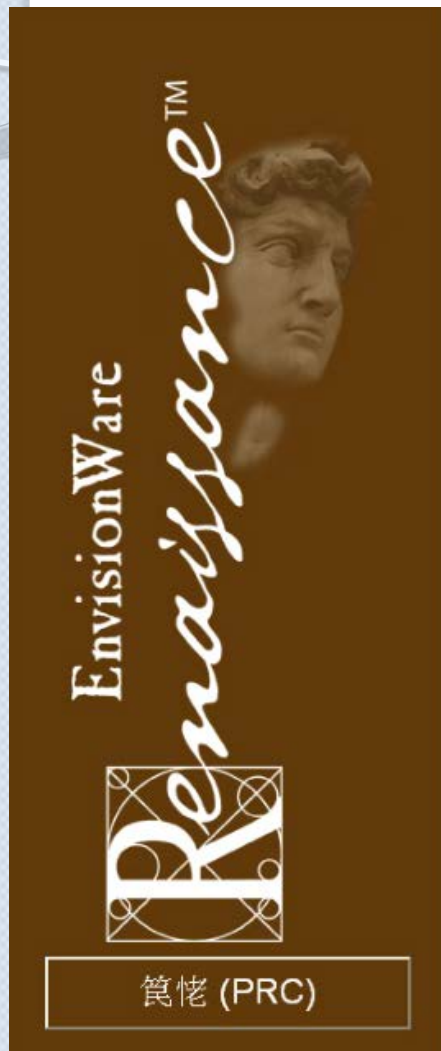- Touch screen for patrons
- Staff can quickly resolve issues

Tech-Logic In-Desk Credit Card Swiper and Receipt Printer

Envisionware Print Station Becomes Full Service Self-Check

RFID AND SELF CHECK-IN

RFID-Enabled Return Shelves

- Bibliotheca Smartblade 210

- Demco Intelligent Trolley

Multipurpose Kiosks

- Lyngsoe Reservation Garage
  - Holds go in lockbox
  - Returns to shelf

- D-Tech Kiosk
  - Holds to slot
  - Returns to shelf

RFID Portable Wands and Handhelds

- PDA style handhelds can do check-in and check-out
- Wand style are for shelf-checking and inventory
- None are great….yet

MEDIA DISPENSERS

Bibliotheca SmartDispenser 200

- 500 discs per tower
- RFID or Barcode

Can Add Multiple Towers

VENDING MACHINES

Envisionware 24-Hour Library

- RFID or Barcode
- Pick up holds, search & borrow, return
- Not self-loading

mk LibDispenser

- RFID Only

- Books and media

- Based unit holds 796 items

- Expansion modules store 378 items

- Walk-up use or full OPAC access

Bokomaten

- RFID Only
- Books and media
- Borrow from and return to machine
- Holds 400 items
- Makes returned items available at kiosk

PIKInc Lending Library

- Barcode or RFID
- Books and Media
- Doesn't accept returns
- Staff must handle check-in and restocking
- Most popular of book vending machines

NEW RFID PRODUCTS

Bibliotheca SmartStock 500

- Read up to 50 tags at once
- Bulk receive items
- "RFID Tunnel"

D-Tech Air Self-Check with MultiTouch Screen

Bibliotheca SmartStock 600

- Detects items on the shelf in real-time
- Can search for items and find out where they actually are
- Utilizes cover-flow display to assist in searching

Tech Logic MyMobileLibrary

- Mobile self-check-out application
- Uses Boopsie
- Check-out with smartphone
- Requires security kiosk to turn off security

OTHER RFID CONSIDERATIONS

Potential Benefits of RFID

- Higher self-check rates
- Better A-V handling
- Recover lost material
- More accurate catalog

- Pull holds faster
- Inventory more likely
- Ergonomic benefits for staff

Privacy Concerns

- *Hot listing*: build a database of bar code numbers of interest and see who's carrying those books
- *Tracking*: keep track of someone based on multiple reads of a book they are carrying

Health Concerns

- Electromagnetic radiation (EMR)
- Interfering with medical devices
  - Pacemakers
  - Hearing aids
  - Cochlear Implants

San Francisco Public Library 2005 Report on EMR

"… currently available research and studies on radio frequency exposure to devices in the frequency range at which an RFID system for libraries operates do not suggest any health risks from radiofrequency (RF) exposures below guideline levels."

Medical Devices

- No known issues with pacemakers or hearing aids
- Issues with cochlear implants:

  "There is no risk of damage to the implant or equipment from these detectors but some users prefer to switch off their speech processor because they may hear a sound as they pass through. Occasionally the security system may be activated by the implant so so it is a good idea to have the ID card to hand."

  - Source: British Cochlear Implant Group (2012)

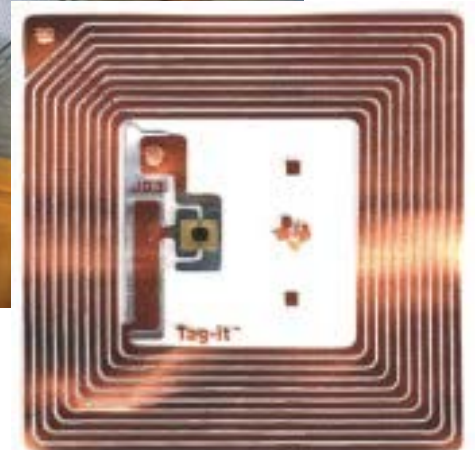# TWO COMPLICATING ISSUES FOR RFID IN LIBRARIES

Smartphones and RFID

- Potential threat of vandalism to RFID tags with NFC-enabled smartphones

If UHF RFID a better choice than HF?

- US Standard based on HF but modifying it to support UHF

- All but two libraries in the US use HF RFID tags – maybe three soon

- UHF used in supply chain – evolving fast

Maybe, if libraries used UHF tags…….

Central Sorters
Library Sorters

SORTERS

CENTRAL SORTERS FOR INTERLIBRARY DELIVERY

Functionality to Look For

- Multiple Sort Plans
  - handle more locations without increasing size of sorter
  - more granular sort
- Flexible sort discharge options
  - switch from totes to bins
  - useful with multiple sort plans
- Labeling
  - apply Hold slip? (vaporware still)
- Support for batch check-in
  - track items sorted to a bin or tote (manifest)
  - receiving library scans bin or tote to check-in all items

Variations in Induction on Central Sorters

Three options:

- One-at-a-time induction (most common)
- Place on conveyor (TechLogic)
- Unloaders (TechLogic)

Footprint and Space Issues

- Some inexpensive sorters can't handle tricky spaces, e.g.
  - around corners
  - through rooms
  - level changes
- Some sorters take up more space than others

Efficiency of Central Sorters

Factors contributing to efficiency

- Staffing required to "man" the sorter
- How much sorting time will be reduced
- How accurate the sorter is
- How well you've configured it for your needs

Lyngsoe High Volume Circular Sorter

http://www.youtube.com/watch?v=eztz_eejYZM

Tech-Logic High Volume Sorter

Envisionware/P.V. Supa Linear Central Sorter

EnvisionWare Modular Sorter - Central Sorter at Las Vegas-Clark County Library District

Lyngsoe 3-in-1 Sorter

- 17-34 sort destinations
- Library and central sort plan

Automated Check-in

LIBRARY SORTERS

Differences Between Library Sorters

- Functionality of conveyor and sorter
- Induction
  - Drop and Go or One-At-a-Time Induction
  - For interior or exterior use
  - For patron or staff use
  - Interface
- Flexibility in configuration
- Curb appeal
- Footprint

Simple Internal One-at-a-Time Patron Inductions

- Doesn't get simpler than this:
- Red / Green Light

- No Touch Screen
- No Access Door
- No Reject Option

External Check-ins

What to look for:

- Can you see the screen?
- Access door
- Ease of use
- Touch screen
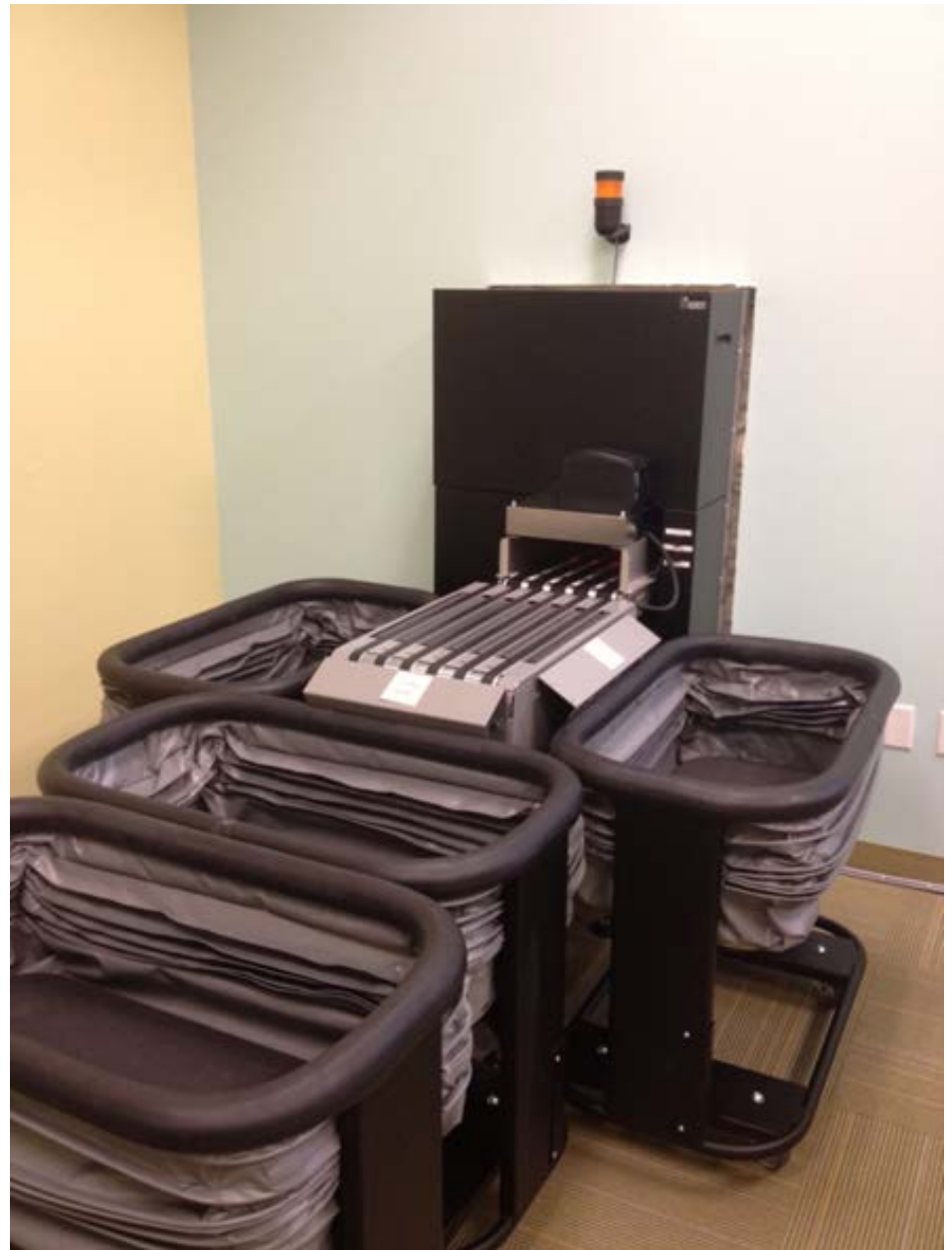- Clear instructions

Don't forget the shelf!

SMALL SELF-CHECK-INS WITH SORTERS

Benefits of Check-in with 3-bin Sort

1. Immediate check-in for patrons
2. Eliminates check-in from staff workflow
3. Separates ready-to-shelve returns from items requiring additional handling
4. Can be used to separate media or items for delivery

Lyngsoe – 3 bin with patron induction

Another Lyngsoe 3-bin Sorter with patron induction

Envisionware WhisperSort

3M Intelligent Return Plus

For Patron and Staff Induction

MEDIUM SIZED SORTERS

Bibliotheca 7-bin with two Patron Inductions

3M 7-bin with Two Patron Inductions

Lyngsoe 11-bin Sorter with Patron and Staff Induction

Bibliotheca 7-bin, 3-induction

LARGE LIBRARY SORTERS WITH MULTIPLE INDUCTIONS

Tech-Logic on Speed

Lyngsoe 28-bin, 3-Inductions

LET'S TALK!

How to Get More Info:

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(707) 763-6869

More resources:

www.galecia.com

http://www.pinterest.com/loriayre/