RFID and other AutoID Technologies in Concert – a Global Perspective

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www.AIM-D.de - www.AIMglobal.org
AIM: Association for Automatic Identification and Mobile Data Communication

- **AIM Global**
  - International network with more than 900 members in 43 countries
  - In the market since more than 30 years
  - Entitled to suggest ISO standards

- **AIM-Deutschland e.V. (AIM-D)**
  - 159 members in Germany, Austria, Switzerland
  - Innovative small and medium enterprises (SME) and international companies like IBM, Infineon, NXP, Siemens, Texas Instruments, Toshiba
  - 22 Alliance partners: research institutes and other associations
  - Cooperation with EU, BMWi, Informationsforum RFID etc.
  - Focused on AutoID and mobile IT infrastructures:
    - Barcode, RFID, sensor technology
    - Mobile data communication
    - Hardware, software, services

- **Trade fair activities:** Tracking & Tracing Theatre, CeBIT, Euro ID, LogiMAT
The Global AutoID Perspective

Contents

- Who is AIM?
- 12 keywords about the workshop program
- Reliable signals – key of AutoID technologies
- The RFID market: history – status – future
- New developments in the barcode area
- Clear benefit opportunities
Workshop program in 12 keywords

<table>
<thead>
<tr>
<th>Topics in keywords</th>
<th>No. of presentations</th>
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</thead>
<tbody>
<tr>
<td>Aviation</td>
<td>2</td>
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<tr>
<td>CPG supply chain</td>
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<tr>
<td>Business value</td>
<td>2</td>
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<td>Anti-counterfeiting</td>
<td>2</td>
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<tr>
<td>Privacy</td>
<td>2</td>
</tr>
<tr>
<td>NFC</td>
<td>1</td>
</tr>
<tr>
<td>Human bodies</td>
<td>1</td>
</tr>
<tr>
<td>Intelligent house</td>
<td>1</td>
</tr>
<tr>
<td>Metallic objects</td>
<td>1</td>
</tr>
<tr>
<td>Antennas and sensors</td>
<td>6</td>
</tr>
<tr>
<td>IT</td>
<td>1</td>
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<tr>
<td>Printed RFID</td>
<td>1</td>
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</tbody>
</table>

Important: RFID in internal processes of suppliers

Added consumer benefits vs. extended privacy threats

Engineering improvements to boost electro-magnetic properties

Innovative technology but no short term substitution of current RFID tags
The generic view: producing reliable signals

Barcode
- Line of sight to the reader required
- 1D linear (EAN13): limited capacity
- 2D: Data Matrix etc.: extended data capacity

RFID
- No line of sight connection to the reader required
- Bulk-reading ability
- Active and passive forms
- Frequencies: LF, HF, UHF, Microwave / Wlan

GPS/GPRS
- Global reach
- No local antennas required

Transforming signals into business information by ERP systems

Business action triggered

Business information: Why?

Signals: What? When? Where?
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Towards the Internet of Things with RFID

- **virtual world** of business processes
- **real world** of business processes

Flow of information and money

Flow of objects: location, time, state/context

Transaction costs raised by media breaks

Progress over time

“Informatising” of objects

Source: Prof. Dr. E. Fleisch, USG

RWA: Real World Awareness
History and future of RFID

In the future:
- Complementary use of AutoID technologies
- Deployment of many specific open and closed RFID applications
- Increased effort needed to outline value strategies
- Privacy issues to be settled with a global perspective

1999 until 2003:
The MIT story about the Internet of Things and billions of tags needed for global item tagging followed by the business perspective of the chip manufacturers:
The 1 cent tag has – unfortunately - not become true.

In the 80s and 90s:
Smart cards for remote locking of car doors and access of buildings

2nd world war: Transponders to distinguish own planes from others
A global supply chain

GPS localization of the forwarded goods

Legal entities involved in the supply chain e.g. warehouses, forwarders, airlines, customs

GPRS data transmission

AutoID service

Virtual fences

E.g. (1) realized by Kuehne + Nagel with GPS equipment by Bosch and (2) goal of IBM’s Secure Tradelane Project with Maersk
Simplifying network structures based on managed services

**Concept:** The services provider as a middleman between a multitude of communication partners in global supply chains

**Required:** Agreement about *shared cost/benefit models* across the supply chain partners and about *standards* to be implemented.

**Before:** m:n network – difficult to manage

**After:** m:1 network - easy to manage
RFID development in the CPG sector

Successes achieved

- Globally coordinated effort:
  - MIT / Auto-ID Labs / EPCglobal / GS1

- Innovation driven by the CPG companies
  - Metro Future Store Initiative and
  - EECC: European EPC Competence Center: Reference laboratory for producers and users of RFID equipment

- Fostering the global image as innovative company
  - See PR award for Metro’s presentation at CeBIT 2006

Obstacles to be mastered

- Deployment delayed because of the obstacles against RFID technology:
  - UHF frequency for item tagging limited
  - Escape: complementary use of HF, UHF and barcode
  - RFID tags still too expensive
  - Lack of RFID and EDI competencies on the suppliers side

- Benefits for suppliers unclear. Needed:
  - More readiness for cross-enterprise process transparency
  - Cost/benefit sharing models in the supply chains
  - Cross-enterprise tracking & tracing services for pallets and other assets
RFID innovation

Solution to the beer keg problem:
- Before: only six kegs readable in an RFID gate
- After: Three pallets with 18 kegs readable simultaneously.
- Achieved by using the keg as amplifier for the RFID tag antenna

Source: Dematic GmbH
www.dematic.de

Same solution idea with car seats:
- RFID tags on car seats use frame as antenna amplifier

Source: Laendmarks project
www.laendmarks.de
Future of RFID

RFID

- Improved antennas and readers, better read rates,
  ... but always threat of electromagnetic disturbances
- Therefore: deployment under way on garments, books
  ... but not on the majority of CPG items (e.g. yoghurt cup)
- Growing on tag data storage – eg. for (MRO) parts
- Agent networks (Meshed networks)::
  - “self-directing packets” (Prof. Dr. M. ten Hompel)
  - Self control of dangerous goods
  - Communication of ship containers
- NFC: RFID dialect of mobile telephones – application scenario
demonstrated at CeBIT 2008: [www.ALLITouch.de](http://www.ALLITouch.de)

Sensors

- Temperature, shock, humidity
- Control of electronic seals

GPS/GPRS

- Global reach for container tracking without local antennas
- Communication with ship infrastructure
## ISO Standards

<table>
<thead>
<tr>
<th>ISO 14443 A/B</th>
<th>Proximity cards: contactless smart cards (10cm)</th>
<th>HF: 13.56 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO 15693</td>
<td>Vicinity cards: contactless smart cards (&gt;1.5 m)</td>
<td>HF: 13.56 MHz</td>
</tr>
</tbody>
</table>

### Neue Familie ISO 18000

<table>
<thead>
<tr>
<th>ISO 18000-1</th>
<th>General air interface specification</th>
<th>Various</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO 18000-2</td>
<td>Reading distance of a few centimetres</td>
<td>LF: &lt;135 kHz</td>
</tr>
<tr>
<td>ISO 18000-3</td>
<td>Successor to ISO 15693 (up to 1.5m)</td>
<td>HF: 13.56 MHz</td>
</tr>
<tr>
<td>ISO 18000-4</td>
<td>Reading distance greater than 100m</td>
<td>Microwave: 2.45 GHz</td>
</tr>
<tr>
<td>ISO 18000-5</td>
<td>Withdrawn</td>
<td>5.8 GHz</td>
</tr>
<tr>
<td>ISO 18000-6c</td>
<td>(&gt; 4 m) Including version EPC Generation 2 (if bit 17 is “0”)</td>
<td>UHF: 860–960 MHz</td>
</tr>
<tr>
<td>ISO 18000-7</td>
<td>Reading distance up to 100 m</td>
<td>433 MHz</td>
</tr>
<tr>
<td>ISO 18047-6</td>
<td>RFID conformity tests</td>
<td>UHF: 860–960 MHz</td>
</tr>
</tbody>
</table>

*Available since summer 2006*

*To be released in 2009*
NFC for the mobile „prosumer“

NFC is the RFID dialect of mobile phones.

Example: All-I-Touch application created by Nitro Snowboards, servtag, TU Munich, CDTM (Institute of the University of Munich) and demonstrated at CeBIT 2008.

Source:
www.allitouch.de
www.servtag.de
www.cdtm.de

Now also available: Bar code reading facility of mobile phones via their camera.

Gesamtpunktzahl: 96 (v. 100)
Telefonfunktionen: 96
Multimedia: 100
Daten/Messaging: 99
Praxis: 94
The RFID market is developing

- **Towards economical strength**
  
as projected by the Bundesministerium für Wirtschaft und Technologie, Berlin:
  
  In Germany „the RFID-influenced share of the Gross National Product will grow until the year 2010 to about 62 Billion Euro from 3 Billion Euro in 2004“, i.e. within six years by the factor of 20.
  
  (Source: European Outlook RFID, July 2007)

- **More than 10% growth p.a**
  
  are the reader manufacturers reporting, e.g. Frithjof Walk, Feig Electronic, Weilburg, and member of the board of AIM-D:

  „The RFID market is developing very positively with revenues increasing by two digit rates…“

- **Billions of chips delivered for the smartcard production**

  are the chip producers reporting, e.g. Infineon and NXP
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Tickets with 2D bar code

- RFID Tags at the tickets of the World Football Championship in Germany were successfully equipped with RFID tags but
- there is an increasing deployment of 2D bar codes in the ticket market
Future of AutoID: Barcode

- Increasing deployment of 2D forms (e.g. Data Matrix):
  - On pharmaceuticals
  - On documents
  - On tickets: railway, airlines, movies
  - On metal parts: Direct Part Marking (DPM)

- Complementary usage in the CPG sector
  - Pallets and cases with RFID, items with barcode
DPM: Direct Part Marking with Data Matrix

Data Matrix
- Various form factors: label, print, hole plate, DPM
- Cheap printers
- High storage ability
- High fault tolerance
The variety of marking technologies

Pharmaceutical products marked with various ID technologies demonstrated at the pharmacy as part of the “Tracking & Tracing Theatre” at the trade fairs CeBIT (Hanover) and Euro ID (Cologne)
Conclusion: clear benefit opportunities possible (I)

Increased revenue
- Less out-of-stock situations
- Improved promotion process
- Improved market release of new products
- Less shrinkage
- Less counterfeited products

Decreased cost
- Less complaints towards suppliers because of wrong shipments
- Improved efficiency at distribution centers

Less capital allocation
- Decreased stock volumes
- Less return shipments and less unsellable items
- Less transport items because of a higher degree of usage
Conclusion: clear benefit opportunities (II)

Advanced transport security
- Electronic seal (eSeal)
- Compliance with Homeland Security
- Less damage by counterfeited products: aviation, automotive, pharmaceuticals

Increased transparency
- For the enterprise financial reporting
- Compliance with SOX (Sarbanes Oxley)

Improved company image
- More reliable shipments
- Less public recalls
- Improved image as innovator

Enhanced consumer service
- Better protection against counterfeited products
- More and faster information about products
RFID – the global view

- Thank you for your attention.

- Be free to put questions now.

- We at AIM are ready to assist you in your projects.

- … and - if you like - some reading stuff in German or English

  Hansen/Gillert: „RFID for the Optimization of Business Processes“

  (Auch in Deutsch im Carl Hanser Verlag, München)