EPCglobal – RFID standards & regulations

Henri Barthel
OECD – Paris, 5 October 2005
Roots of EPCglobal

• Auto ID Center (launched in 1999)
  – Six world-class academia Labs: MIT (US), Cambridge (UK), Adelaide (Australia), Keio (Japan), Fudan (China), St Gallen (Switzerland)
  – 100 sponsoring User companies and Solution Providers
  – The Electronic Product Code (EPC), a unique identity to individual physical objects
  – Cheap sensing of object EPC codes using RFID
  – Access to EPC related data through the Internet

• GS1 launches EPCglobal in November 2003
  – Experienced standards making body
  – 30 years experience in barcodes & Electronic Data Interchange
  – 101 Member Organisations
  – 1.1 million firms in 140 countries
EPCglobal Mission

• Develop technical specifications and standards
• Facilitate mass adoption across all industries
• Provide compliance and interoperability services
  – RFID conformance certification run by MET Labs
  – Performance test center accreditation program
• Drive education and training
• Provide continuing support for cutting-edge research performed by Auto-ID Labs
EPCglobal Organisation

GS1 Management Board

EPCglobal Board of Governors

Architecture Review Committee (ARC)

President, EPCglobal

Staff

Business Steering Committee (BSC)

Technology Steering Committee (TSC)

Auto-ID Labs

Public Policy Steering Committee (PPSC)

Fast-Moving Consumer Goods Business Action Group
- Tag Data Standards WG
- Data Exchange WG
- Pilot & Implementation WG
- Euro & Asian Adoption WGs

Health & Life Sciences Business Action Group
- Process WG
- Policy WG
- Infrastructure WG

Hardware Action Group
- UHF Gen 2 WG

Software Action Group
- Reader Protocol WG
- Reader Management WG
- Filtering/Collection WG
- EPCIS WG
- ONS WG
- Tag Data Translation WG
Intellectual property

• Complex and important issue
• Balance between commercial interests, technology development and affordable products
• EPCglobal aims to provide royalty free standards. However, Reasonable And Non Discriminatory (RAND) IP claims accepted exceptionally
• ISO Intellectual Property rights policy based on RAND
• Patent pool created recently for RFID Gen 2 products – Good approach for Users and Solution Providers: simple, fair and cost effective
RFID

Tag

Reader

Air Interface Protocol
Technical specifications

Regulations
Laws and rules on how the technology can be used
Electromagnetic spectrum

The “RFID” Frequencies

- **125-134 KHz**
- **13,56 MHz**
- **433 MHz**
- **2,45 and 5,8 GHz**
- **860-960 MHz**
ISO standards for RFID

• Standards exist in different areas:
  – Animal identification
  – Cards and Personal identification
  – Containers ID

• For item management applications, standards are developed by SC31, a subcommittee of Joint ISO/IEC Technical Committee 1 (JTC 1) on Information Technology
ISO/IEC JTC1/SC31

Chair A. Haberman (USA)

SC31 Secretary
GS1 US (USA)

Data Carriers
Chair S. Ackley (USA)

Data Content
Chair T. Yoshioka (Japan)

Conformance
Chair C. Biss (USA)

RFID
Chair H. Barthel (GS1)

RTLs
Chair M. Harmon (USA)

Standardisation of data formats, data syntax, data structures, data encoding, and technologies for the process of automatic identification and data capture
ISO/IEC 18000 Air Interface specifications

- 18000-1: General guidelines
- 18000-2: less than 135 KHz
- 18000-3: HF 13.56 MHz
- 18000-4: 2.45 GHz
- 18000-6: UHF 860-960 MHz
- 18000-7: 433 MHz

These are all formal ISO/IEC standards
EPCglobal RFID standards

- The RFID technology that gets most attention today is UHF (Ultra High Frequency)
- UHF is a good compromise between reading speed, distance, multiple tags handling and cost.
- UHF Generation 2 specifications approved as EPCglobal standard in December 2004
- Gen2 has been submitted to ISO, should be published as ISO standard in March 2006
Frequency Allocation
Regulatory infrastructure

- Spectrum allocation to allow use of Gen2
- UHF spectrum (860-960 MHz) and power regulations (2w erp/4w eirp)
- Significant progress made:

<table>
<thead>
<tr>
<th>ITU Region</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU and Africa</td>
<td>EU</td>
<td>USA</td>
<td>Australia</td>
</tr>
<tr>
<td>CEPT/ETSI</td>
<td>Canada</td>
<td>New Zealand</td>
<td>New Zealand</td>
</tr>
<tr>
<td>South Africa</td>
<td>Central America</td>
<td>South Korea</td>
<td>South Korea</td>
</tr>
<tr>
<td>Israel</td>
<td>South America</td>
<td>Singapore</td>
<td>Singapore</td>
</tr>
</tbody>
</table>

©2005 EPCglobal Inc
RFID UHF regulations in Asia recent developments

- **Japan** has formally allocated 952-954 MHz on April 5\(^{th}\) 2005
- **India** has formally allocated 865-867 MHz (4W erp) on May 4\(^{th}\)
- **China** is evaluating the possibility to release a band for RFID within the 917-925 MHz range
- **Malaysia** is working with the industry. New regulations being considered
- Other Asian countries are expected to adapt their existing regulations
RFID UHF regulations in Europe

- New European regulations for RFID at UHF (ETSI EN 302 208) were approved in September 2004 and have to be translated into national laws
- Regulations in place in Cyprus, Denmark, Finland, Germany, Iceland, Latvia, Slovenia and Switzerland. Should be completed by October 2005 in Sweden and UK
- France, Spain, Italy, Turkey have an issue due to conflict with existing frequency allocations
- European Commission can speed up or enforce regulations
UHF regulations overview

- Adequate regulations in place (70% of global economy)
- Regulations should be in place by mid-2006 (13%)
- Conflicts with established regulations (11%)
- Information not available (6%)
The EPCglobal Network Infrastructure

- Standard data
- Standard air protocol
- Standard software Interfaces
- Standard query language
- ONS - Object Naming Service
- Internet
- EPC Information Services
- Standard network architecture

- RFID tag
- EPC - electronic product code
- ID
- telemetry
- reader
- computers
- data

©2005 EPCglobal Inc
EPCglobal Standards Overview

EPCglobal Core Services and other shared services

Peer-to-peer exchange of data about EPCs

Shared Service Interactions

Exchange of physical objects with EPCs

EPCglobal Subscriber

EPCglobal Subscriber

EPC Data Exchange Standards

EPC Infrastructure Standards

EPC Physical Object Exchange Standards
EPCglobal Standards Overview

EPC Tag Data Standard

RFID Protocols
- Class 0
- Class 1
- UHF Class 1 Gen 2

Exchange of physical objects with EPCs

EPC Data Exchange Standards

EPC Infrastructure Standards

EPC Physical Object Exchange Standards
EPCglobal Standards Overview

EPCglobal Core Services and other shared services

EPC Data Exchange Standards

EPC Information Services (EPCIS)

Object Name Service (ONS) “Discovery Services” (future)

EPC Manager Number Assignment

Shared Service Interactions

Peer-to-peer exchange of data about EPCs
EPCglobal Standards Overview

Reader Protocol

Reader Management

Filtering & Collection

EPCglobal Subscriber

EPCglobal Subscriber

Exchange of physical objects with EPCs

EPC Data Exchange Standards

EPC Infrastructure Standards

EPC Physical Object Exchange Standards
“at time $T$, the association of the following case tags to the following pallet tag was created at palletizer #3, to fulfill order #1234”

“between the time the case crossed the first beam and the second beam at location $L$, the following tag was read”

dozens of individual tag read events from specific antenna

What, Where, When, Why

What, Where, When
Conclusions

• Large-scale RFID implementation have started
• Standards and regulations are critical enablers
• The issue is broader than RFID, it is about transforming supply chains and access to information in a global collaborative framework

Thank you for your attention
henri.barthel@gs1.org