HUG Primer
EPC

Berlin, 30 January 2007
Craig Alan Repec

The global language of business
www.gs1.org
What we’ll cover in this session…

1. Fundamentals of RFID
2. EPCglobal Standards
3. EPCglobal Network – “Internet of Things”
4. EPCglobal Organization
Radio Frequency Identification (RFID)

- Non-contact data transmission by means of radio waves
- Read ranges of up to several meters
- High storage capacity
- Re-writeable data
- No line-of-site contact necessary
- Simultaneous identification of multiple items
Transponder Layout

- Inlay
- Microchip
- Antenna

REAL-WORLD™ RFID

SCIN: 30000000000000000000000043

865 - 928 MHz Gen2

AVERY DENNISON

GS1 HUG
Components of an RFID System

Computer Application | Reader | Transponder

Local Interface | Air Interface
... but up to now, only in closed systems
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EPC: A pillar of the GS1 System

The global language of business

OVERALL BENEFIT: Improving efficiency & visibility in supply and demand chains

GS1 SOLUTIONS & SERVICES USING GS1 STANDARDS
Solutions: POS / Inventory Management / Asset Management / Collaborative Planning / Traceability
Services: Global (GSMP, GEPIR, Global Registry, Training and Accreditation) & Local (e.g. Certification, Implementation, Training)

GS1 System - Integrated system of standards

GS1 BarCodes
- Global standards for automatic identification
- Rapid and accurate, item, asset or location identification

GS1 eCom
- Global standards for electronic business messaging
- Rapid, efficient & accurate business data exchange

GS1 GDSN
- The environment for global data synchronisation
- Standardised, reliable data for effective business transactions

GS1 EPCglobal
- Global standards for RFID-based identification
- More accurate, immediate and cost-effective visibility of information

GS1 Identification Keys (e.g. GTIN, GLN, SSCC, GRAI, GIAI, GSRN, EPC) & Attribute Data (e.g. Best Before Date)
Electronic Product Code (EPC)

- Identification of individual objects
- On the basis of RFID (transponder as data carrier)
- Globally unique and collision-free
- Access key to additional information stored in databases
EPC: one of the Identification Keys on which the GS1 System is built
EPC at item, case and pallet level

SGTIN (serialized GTIN)

Serial Shipping Container Code (SSCC)

Global Returnable Asset Identifier (GRAI)
Global Individual Asset Identifier (GIAI)
EPCglobal Standards Overview

[Diagram showing the integration of various systems and services within the EPCglobal framework, including Secure Internet Exchange, Event Registries, Search and Discovery, and Private Network.]
Compatibility GTIN – EPC SGTIN

**GTIN**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Company Prefix</th>
<th>Article</th>
<th>Check Digit</th>
<th>Serial Number</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>4012345</td>
<td>00734</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

**EAN 128 Barcode**

(01) 0 4012345 00734 (21) 2

**EPC 96 Bit**

<table>
<thead>
<tr>
<th>Header</th>
<th>Filter</th>
<th>Partition</th>
<th>EPC Manager</th>
<th>Object Class</th>
<th>Serial Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 Bit</td>
<td>3 Bit</td>
<td>3 Bit</td>
<td>24 Bit</td>
<td>20 Bit</td>
<td>38 Bit</td>
</tr>
<tr>
<td>0011 0000 binary</td>
<td>001 binary</td>
<td>5 decimal</td>
<td>4012345 decimal</td>
<td>000734 decimal</td>
<td>2 decimal</td>
</tr>
</tbody>
</table>
Binary – on-tag representation
001100000111010000100101011110111111010001100010010
111111100000000000000000000000010

Tag’s Uniform Resource Identifier (URI) –
in software when all tag info needs to be represented
urn:epc:tag:sgtin-96.3.0614141.100743.2

Pure Identity URI – just the EPC
urn:epc:id:sgtin:0614141.100743.2
EPCglobal Standards Overview

Secure Internet Exchange

Event Registries

Search and Discovery

ONS

Internal Systems (ERP, WMS, etc.)

EPC IS

TAG Data Standard

EPC Readers

EPC Middleware

Private Network

PRIVATE

PRIVATE

GEN 2 AIP

EPCglobal Standards Overview
Specifies...

• **physical transfer** of data between transponder and reader

• **Commands** which the reader can execute in its communication with transponders

• **Anti-collision procedures** for simultaneous reads

Features include...

• EPC Air Interface ⇒ ISO 18000-6 Part C

• Frequency: UHF

• High read & write speeds (50-200 tags/second)

• KILL Function
EPCglobal Standards Overview

- Event Registry
- Search and Discovery
- Secure Internet Exchange
- Application Program Interface (API)
- Security Specifications
- ALE F&C
- Tag Data Translation
- Reader Management
- Reader Protocols
- Tag Data Standard
- GEN 2 AIP
- EPCIS protocols
- EPC IS
- EPC Middleware
- EPC Readers
- ONS
- Internal Systems (ERP, WMS, etc.)
<table>
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<th><strong>EPCglobal Standards Overview</strong></th>
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<tr>
<td><strong>Tag Data Standard</strong></td>
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<tr>
<td><strong>G2 Air Interface Protocol</strong></td>
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<tr>
<td><strong>Reader Protocol</strong></td>
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<td><strong>Reader Management</strong></td>
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<tr>
<td><strong>Tag Data Translation</strong></td>
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<tr>
<td><strong>Filter and Collection ALE</strong></td>
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<tr>
<td><strong>ONS Application Layer Interface</strong></td>
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<tr>
<td><strong>EPC IS Protocols</strong></td>
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<td><strong>Security Specification</strong></td>
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<td><strong>Network Architecture</strong></td>
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Traditional EDI vs. EPCglobal Network

EDI (EANCOM or X12): **process-centric**
- Request for action or a series of actions to generate an event or service

EPCglobal Network: **event-driven**
- Automatic logging of movement and events in real time, as they are occur

What’s **already** happened?
What needs to happen?
EPC Information Services (EPCIS)
EPCIS Events

- **Which** EPC numbers have been read?
- **When** have the EPC numbers been read?
- **Where** have the EPC numbers been read?
- **Why** have the EPC numbers been read?

EPCIS **events** are the basis for improving business processes
The EPCglobal Network

Supplement Chain Visibility

Event Related Information

- ORGANIZATION A
  - Internal Systems (ERP, WMS)
  - EPC Middleware
  - EPC Reader Mgmt
  - Readers
  - EPCIS
  - Security Authentication Authorization
  - Discovery Services (Search, ONS, Event Registry)

- ORGANIZATION B
  - Internal Systems (ERP, WMS)
  - EPC Middleware
  - EPC Reader Mgmt
  - Readers
  - EPCIS

Tagged Units Moving Through the Supply Chain
The power of event-related information…

- Improved consumer availability
- Demand driven supply chain
- Reduced inventory
- Increased productivity
- Reduced claims and resolution costs
- Reduced shrinkage
- Improved promotional effectiveness
- Reduced counterfeit
- Improved ability to track and trace
• If you can’t see it, you can’t measure it

• If you can’t measure it, you can’t control it

• If you can’t control it, it’s probably costing you too much money

• And you probably don’t even know how much
Flow of goods in the EPC Showcase

http://www.gs1-germany.de/internet/content/e39/e52/e2685/e2688
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EPCglobal Organization

- Founded in 2003 by von GS1 und GS1 US
- Specifications based on the work of the Auto-ID Center at MIT
- User-driven and user-sponsored
- GS1 Member Organizations (MOs) are the exclusive representatives of EPCglobal at national level
Partnership between 100 global firms, including founders:
- Uniform Code Council (GS1 US)
- EAN International (GS1)
- Procter and Gamble
- Gillette

Global:
- Standards Development
- Adoption
- Brand management and marketing
- Policies (Privacy, Intellectual Property)

Local:
- 101 countries worldwide
- Member communication
- Member Support
- Training and Education

Continued Research
EPCglobal Inc Organisation Chart

GS1 Management Board → EPCglobal Board of Governors → GS1 US Board of Governors

Architectural Review Committee → President, EPCglobal → Staff

Business Steering Committee
- Business Action Group - FMCG
  - Work Groups
- Business Action Group - HLS
  - Work Groups
- Business Action Group - TLS
  - Work Groups

Technology Steering Committee
- Software Action Group
  - Work Groups
- Hardware Action Group
  - Work Groups

Auto-ID Labs
- Adelaide Univ., Australia
- Cambridge Univ., UK
- Fudan University, China
- ICU, South Korea
- Keio University, Japan
- MIT, Cambridge, USA
- St Gallen, Switzerland

Public Policy Steering Committee
- European Working Group

Virtual organization ~ 2000 individuals
GS1 Member Organizations (MOs) – Representatives of EPCglobal at national level
European EPC Competence Center (EECC)

- Accredited as EPCglobal Test Center in September 2005
- Focus on European regulations and processes
- Goal: support the rollout of RFID and EPC in Europe
EECC’s Service Portfolio

RFID Testing

Applied Tag Performance (ATP)
- Transponder Placement
- Read Range (860 - 960 MHz)
- Orientation Sensitivity (360°)

“Real Life” Dynamic Testing
- In live production environment

Custom RFID Testing
- Individually tailored

RFID Education Program

- Technical principles and functions
- EPCglobal & ISO Standards
- RFID regulations
- EPCIS, EANCOM® interim solution
- Applying transponders
- System and application design
- User reports from EPC pilots

Instructors from standardization (GS1), users (industry/retail/logistics) and technology manufacturers and providers

Further info: epc@eecc.info

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EECC’s RFID Education Program: 2007 Sessions

**Fundamentals of RFID & EPC**
*Grundlagen RFID und EPC*

**Criteria for a Successful Rollout**
*Einflussfaktoren der erfolgreichen RFID-Einführung*

**UHF Expert Training**
*Expertentraining UHF*

**Tuesday**
*Dienstag*

6. März
24th April

**Wednesday**
*Mittwoch*

7. März
25th April

**Thursday**
*Donnerstag*

8. März
26th April

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