# Auto-ID and the EPC Network

Steve Hodges, Technical Director Auto-ID Lab

- Vision and motivation
- Transition to EPCglobal
- Technological solution
- Applications





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# Nomenclature

- Presentation will focus on the EPC Network
  - A collection of technologies, named after key component
- EPC Network developed by academics with industry
  - Under the banner of “Auto-ID Centre”
  - Naturally referred to as “Auto-ID technology”
  - “Auto-ID” term actually quite old
  - AIDC also ambiguous

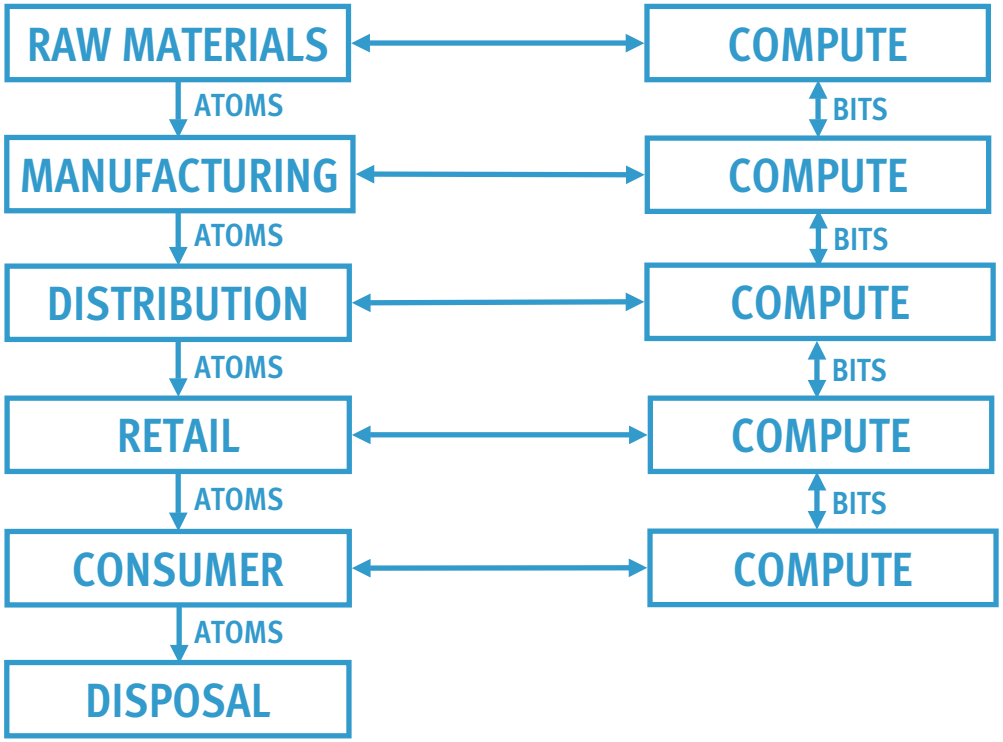
# Auto-ID Centre vision

- Mission
  - Re-think the role and implementation of the barcode
  - Change the world by merging bits and atoms

# Networks of bits and atoms

Supply chain:
network of atoms

Internet:
network of bits




- E-commerce links them
- E-business extends this





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# Networks of bits and atoms

Supply chain:
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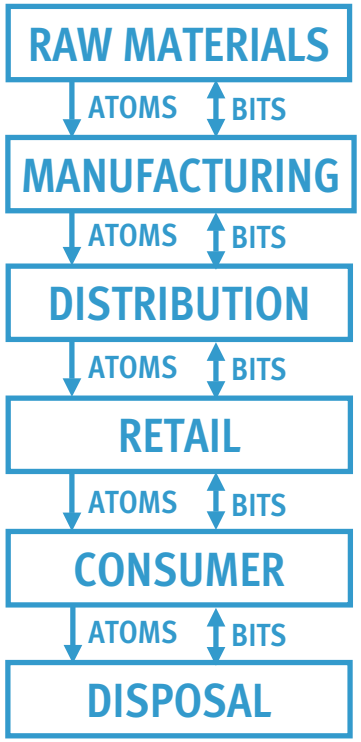


- EPC Network *merges* them
- 'Internet of things'
- Everything is networked





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# Auto-ID Centre vision

- Mission
  - Re-think the role and implementation of the barcode
  - Change the world by merging bits and atoms
- What do you need to do this?
  - Some way of automatic, reliable transfer and update of information based on physical operations
  - One single system for the whole supply chain
- Key functions of the Centre
  - Bring together appropriate technologies
  - Bring together interested parties
  - Generate open standards
  - Drive adoption

# Auto-ID Centre sponsors

- Gillette
- Wal-Mart
- P&G
- Unilever
- Kraft
- Philip Morris
- Nestle
- Best Buy
- Target
- Tesco
- Home Depot
- CVS
- BT
- Sun
- Philips
- Intel
- ST Micro
- Can
- Metro
- Mitsui
- Pfizer
- Sara Lee
- USPS
- UPS
- Do
- iture
- IBM
- Coca-Cola
- Pepsi
- Kodak
- NCR
- SAP
- Symbol
- Ahold
- Metro
- Carrefour
- Kelloggs
- Kimberly Clark
- Johnson & Johnson
- Home Depot
- Chep
- AC Neilson
- Accenture
- CGEY

**Over 100 in total!**





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# Transition to EPCglobal

- Ultimately, needed to leave the University Labs…
  - ‘End of Auto-ID Centre’ always in mind
  - Natural to move away from University environment
- EAN.UCC selected as partner to commercialise research
  - Barcode ‘custodians’ natural candidates
- Auto-ID Labs will continue, but with a purely research role
  - Ongoing enhancement and extension of the EPC Network needed
  - Maintain existing structure and forum
  - Research Advisory Council oversees research programme

# EPCglobal and Member organisations (MOs)

- EAN.UCC International consists of ~100 MOs
  - EAN International HQ in Brussels is not huge
  - MO acts as national representative of EAN
  - UCC is just one MO (albeit a big one)
- EPCglobal has similar structure
  - Boston-based HQ provides direction and central management
  - National MOs provide support for that region
  - In most cases EPCglobal benefits are additional MO subscription
  - UCC decided to create new company (EPCglobal US)

# EPCglobal and member organisations (MOs)

EPC global

- Global standards development and governance
  - Global standards development and management
  - Public Policy and Intellectual property
  - Training and education templates
  - EPCglobal brand
  - Marketing templates

MOs

- Local deployment of standards, implementation and support services
  - Local market development
  - Local training and education
  - Local member implementation support





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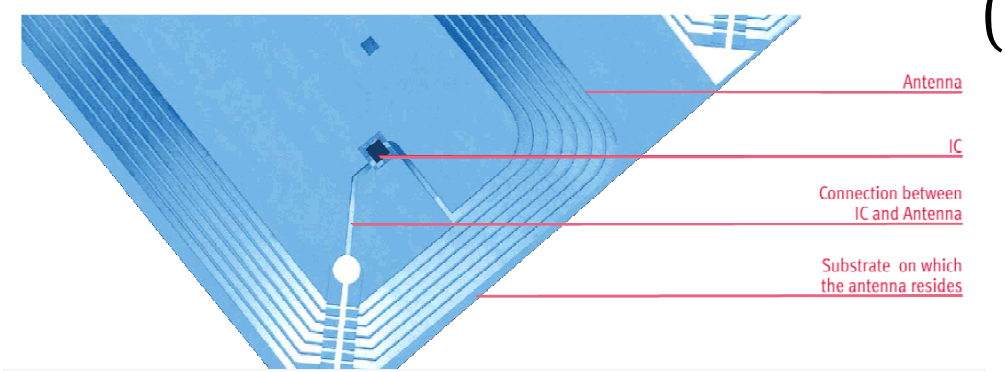
# Auto-ID and the EPC Network

- Technological solution
- Applications

# Technology overview (1)




- Radio frequency identification (RFID)
  - Tags and readers
  - Radio has benefits over barcodes
  - Cost is critical

01.0000A89.000016F.000169DC0

Header 7 bits | EPC manager 28 bits | Object class 24 bits | Serial number 36 bits

- The Electronic Product Code (EPC)
  - *Unique* number stored in RFID tag
  - Associated info stored on network
  - Scaleable and extensible





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# Technology overview (2)

- Physical markup language, PML
  - Language for describing events, operations etc.

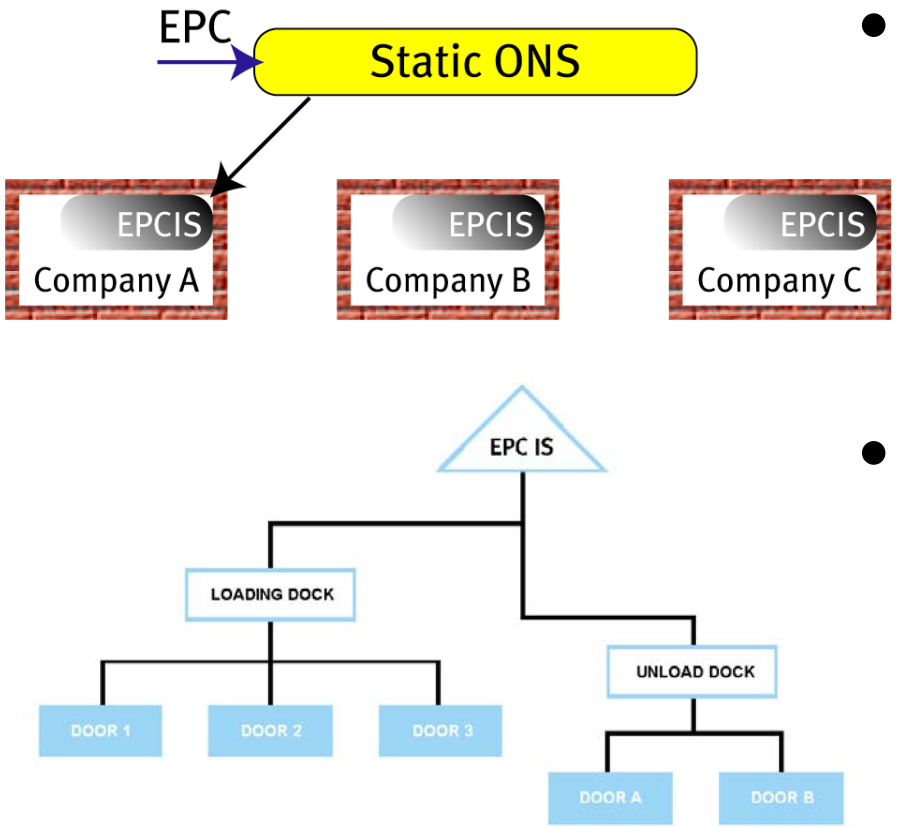
```
<?xml version="1.0" encoding="UTF-8"?>
<pmlcore:Sensor xmlns:pmlcore="urn:autoid:specification:interchange:PMLCore:xml:schema:1"
xmlns:pmluid="urn:autoid:specification:universal:Identifier:xml:schema:1"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="urn:autoid:specification:interchange:PMLCore:xml:schema:1/SchemaFiles/Int
  <pmluid:ID>urn:epc:1:4.16.36</pmluid:ID>
  <pmlcore:Observation>
    <pmluid:ID>00000001</pmluid:ID>
    <pmlcore:DateTime>2002-11-06T13:04:34-06:00</pmlcore:DateTime>
    <pmlcore:Command>READ_PALLET_TAGS_ONLY</pmlcore:Command>
    <pmlcore:Tag>
      <pmluid:ID>urn:epc:1:2.24.400</pmluid:ID>
    </pmlcore:Tag>
    <pmlcore:Tag>
      <pmluid:ID>urn:epc:1:2.24.401</pmluid:ID>
```

# Technology overview (3)

| Storage of 'EPC-related' data | |
|---|---|
| **Timestamped event data** | **Attribute data (often static)** |
| Observations (tag readings) | Attributes defined at serial level e.g. date of manufacture, expiry |
| Measurements (sensor data) | |
| Symbolic Location/Containment | Attributes defined at product level, e.g. mass, dimensions |
| EPC <–> Transaction ID | |

- EPC information service
  - Networked database
  - Interface w/ existing data sources
  - Registry for event information
  - Query support

# Technology overview (4)




- Object naming service (ONS)
  - Redirection service – telephone book
  - Similar to DNS, with additions
- Savant
  - Collects and filters RFID 'blips'
  - Generates higher level events
  - Provides common interface





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# Auto-ID and the EPC Network

- Applications

# Up-coming application areas: 1. Retail supply chain

- Shrinkage
  - Theft by consumers and staff
  - Errors during distribution
  - Diversion from authorised channels (exports, promotions etc)
  - Damage to stock, unusable returns etc.
  - Costs €18bn in Europe pa, cost of prevention €2.1bn, plus lost sales
  - IBM predict 66% reduction of mfr errors @cases, 47% retailer total @items
- Out of stocks/poor on-shelf availability
  - Causes consumers to go without or buy alternatives
  - 8.3% worldwide, 1% Wal-Mart
  - Wal-Mart US$1bn sales increase for 0%
  - IBM predict store execution OoS reduction of 33% @cases, 50% @items
- Traceability
  - Increasingly important, especially in food/drug industries
- Inefficiencies in supply chain operation
  - Cost of running current supply chains
  - Transportation and logistics costs 8% of sales
  - Data inconsistency costs $50bn across SC
- Specific drivers
  - Walmart directive – case level for top 100 suppliers, Jan 05
  - US DoD, Tesco, Metro



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# Applications:
# 2. Pharmaceutical

- Asset and patient tracking
  - Medical equipment
  - Patient records – continuity of care
  - Drugs
  - Physicians
- Product recalls
  - Can associate specific batches with specific patients
- Anti-counterfeiting
  - Audit trail on drugs and equipment
- Automated dispensation and 'polypharmacy' checks
  - BMJ suggests 11% of patients suffer from mistakes in dispensation
  - US Figures estimate ~7000 deaths pa due to medical errors

# Applications:
# 3. (Food) Traceability

- Pressure to assure to ensure food integrity & safety
- Driven by
  - Global food safety initiative (GFSI)
  - EU directive 178/2002 Article 18, Jan 2005
  - US Bio-terrorism act
  - EU common agricultural policy
- Ability to identify and record exact, instance level
  - Source
  - Processing
  - Storage
  - Transportation
  - Ownership
- Also tobacco, drinks industries

# Applications:
# 4. Reverse logistics

- All aspects of reverse logistics/EOL management
  - Recycling
  - Re-use
  - Trade-in
  - Maintenance
  - Upgrade
  - Recall
- Instance-level information readily accessible
  - Full product/sub-component history
  - Static and dynamic data
- Legislative drivers
  - WEEE directive
  - Other European and Japanese legislation

# Applications: 5. Manufacturing

- Automatic, responsive manufacturing environment
  - Need to be responsive to the unexpected
  - Wrong deliveries, machine failures, order changes
  - Demands for shorter lead times, customisn
- Tagging
  - Components, sub-assemblies
  - Knowledge of what is where in production cycle
- Distributed intelligent control
  - No single controller, no pre-determined plan
  - Human operators can be part of control system

# Auto-ID and the EPC Network

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- Transition to EPCglobal
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# Learn more and become involved...

- Engage with CDAC/Cambridge Auto-ID Lab
  - Membership of research centre (www.ifm.eng.cam.ac.uk/automation)
  - Sponsorship of particular projects
  - *easy*EPC™ training courses (www.easyEPC.com)