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# RFID and Sensors in the Supply Chain

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Director

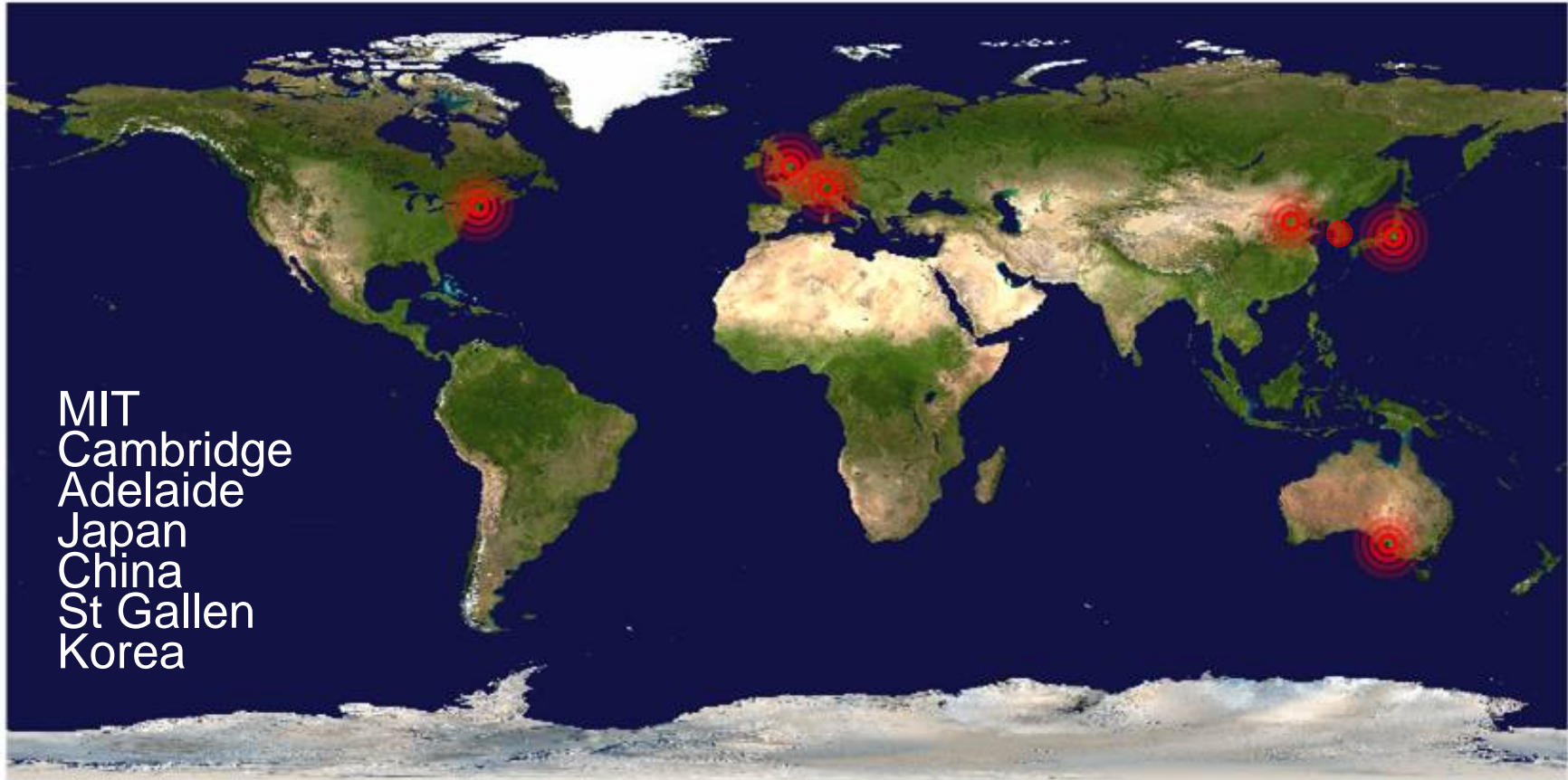
Cambridge Auto ID Labs

<http://www.autoidlabs.org.uk/>

DTI Sensors Event, London

19 October 2005

# Auto-ID Labs - a global network



# Cambridge Auto ID Lab

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- Supply Chain Automation & Control
- Involvement in RFID and its integration since 2000 (Auto ID Center)
- Currently driving research initiative in the aerospace sector ([www.aeroid.org](http://www.aeroid.org))
- Involved in other activities in automation, consumer goods, electronic, recycling sectors
- Developed a series of short term tools for companies adopting RFID

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- RFID Overview
  - Background to Recent Developments
  - RFID in the Supply Chain of the Future
  - Sensor Issues

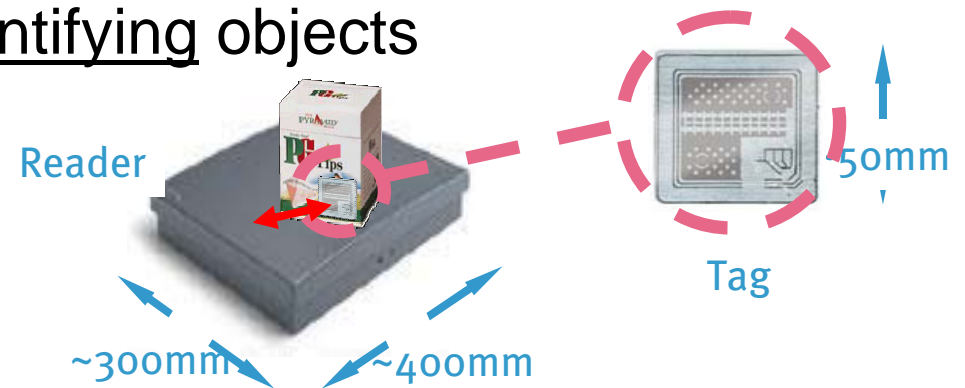
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# RFID Overview

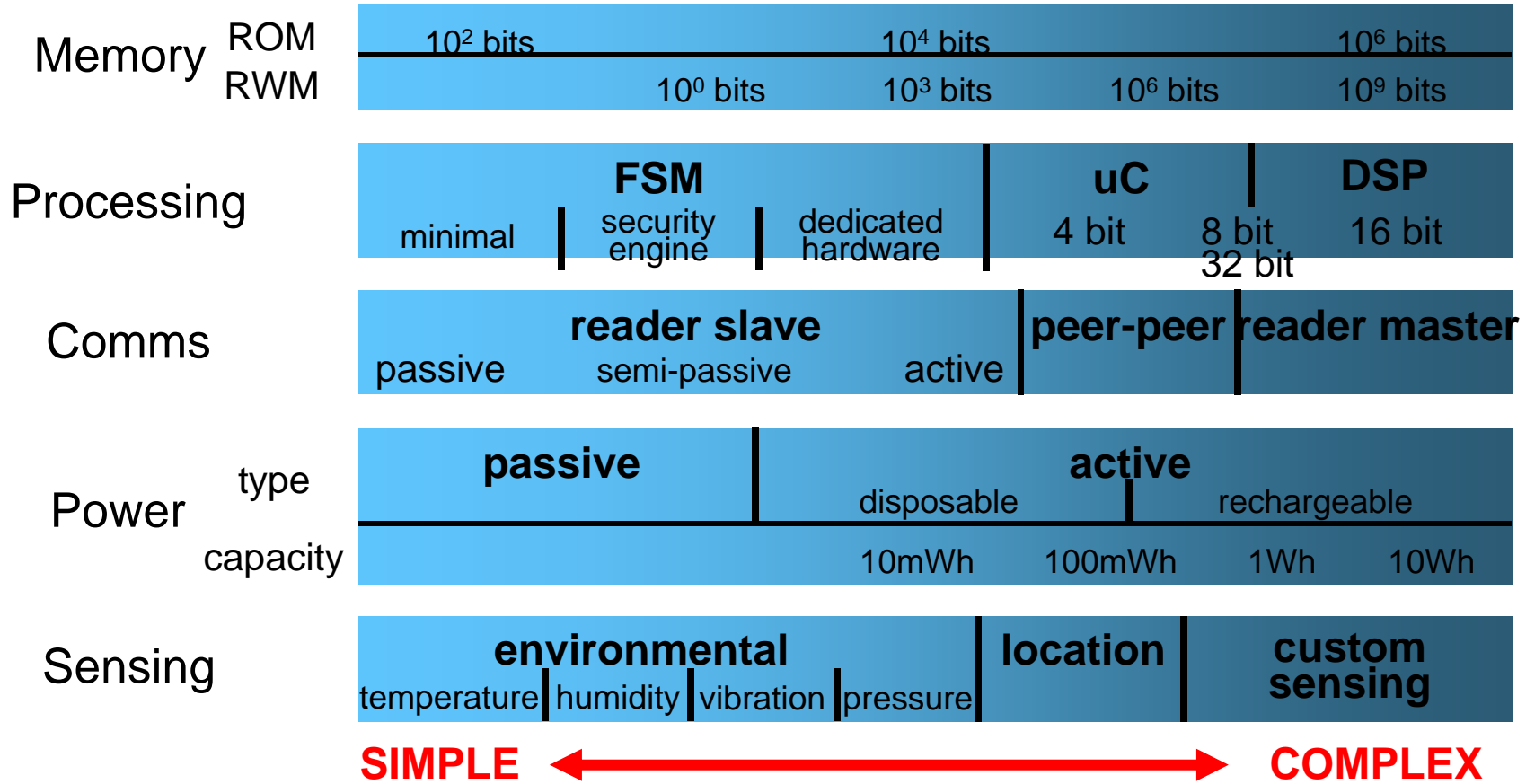
# What is RFID ?

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- *Radio frequency* identification
- Means of automatically identifying objects
- Typical operation
  - 64 bits to few kilobits of data
  - Range ~1cm to ~10m
  - 50-1000 tags per second
- Reader transmits radio frequency energy
  - Provides power for the tag (if no battery)
  - Enables communication to and from the tag
  - Different operating frequencies (affects range, tag size, cost)



# RFID Tag Functionality



# Why RFID?

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- Alternative technologies
  - Barcodes (traditional and 2D)
  - Vision systems
  - Magnetic strips
- ✓ ‘Simultaneous’ identification
- ✓ Robust, reasonable operating distance
- ✓ No line of sight; automated reads
- ✗ Not as cheap as some alternatives
- ✗ Some problematic items

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# Background to Current Developments

# Background: RFID Timeline

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- Invented in WWII
- First commercial applications in 1970's
- Larger scale deployment started in 1990's
  - Incompatible products optimised in different ways
  - Vertical application areas
    - Libraries
    - Access
    - Industry
    - Electronic Article Surveillance
- *Standardisation efforts and tech devts in late 1990's*
  - *Create interoperability, drive down costs*
  - *Opens up a whole new set of applications*

# Background: Auto ID Center (1999-2003)

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- **Mission**

- Re-think the role and implementation of the barcode
- Connecting information and physical flows (“ bits to atoms”) in the supply chain

- **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
- RFID as the key element.....

- **Project:** 103 companies, 6 universities, \$15M

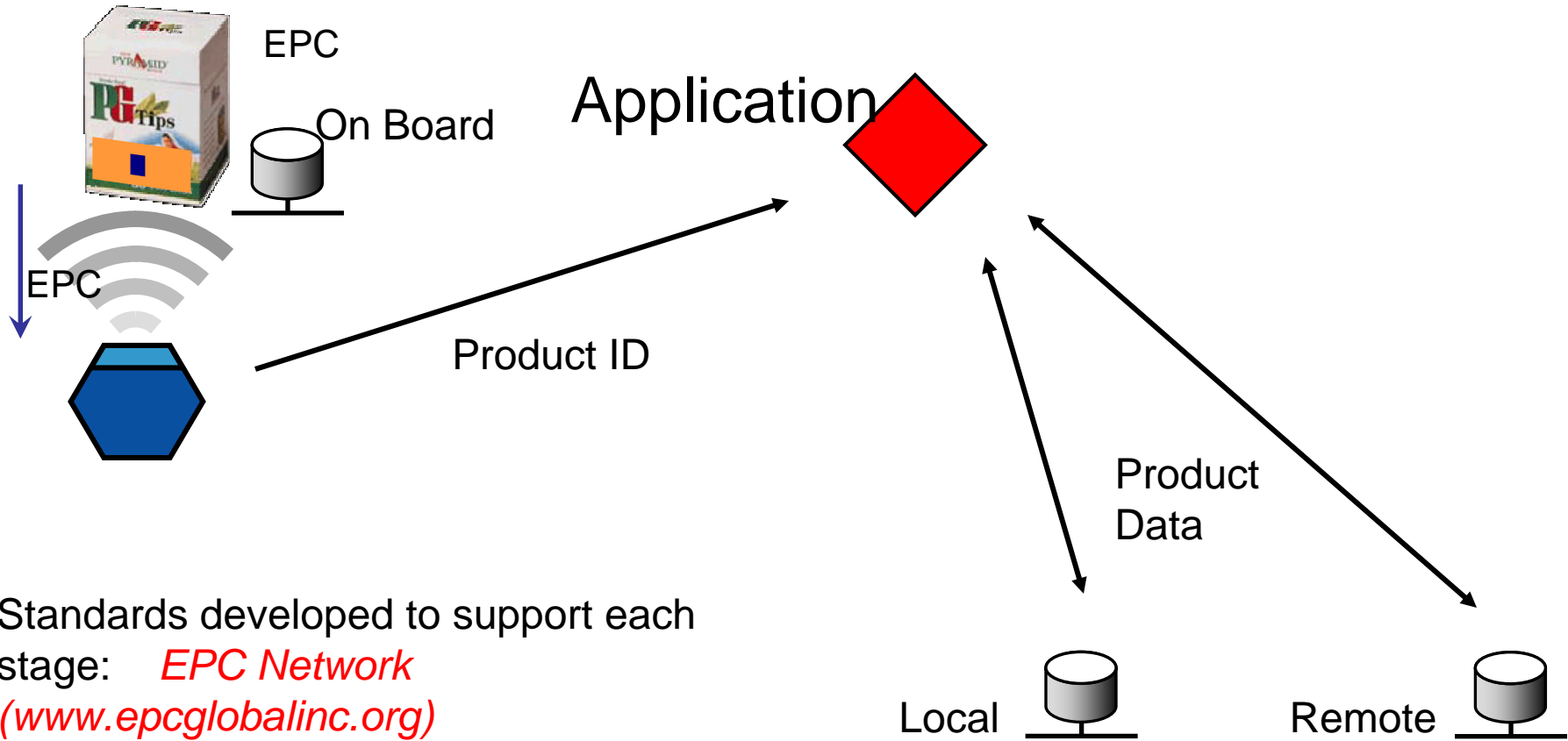


# Background: Key Thrusts

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1. low cost tags and reader systems
  - > reducing chip price = reducing amount of silicon
  - > minimising information stored on chip
  - > ID on chip only, other information on data base
  
2. business justification through multiple applications/companies
  - > standardised tag/reader systems
  - > standardised data management and comms
  - > RFID network as extension to the internet

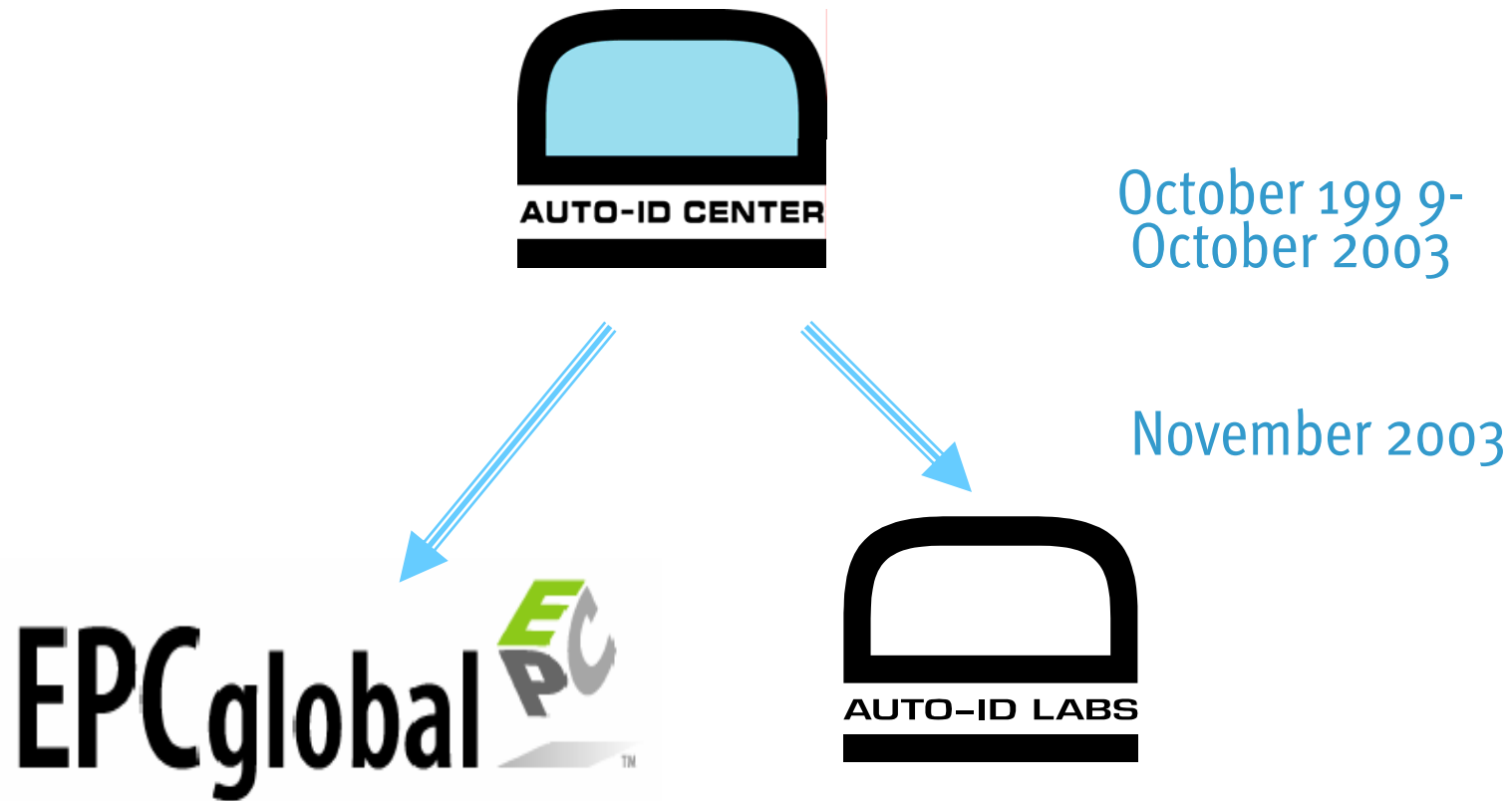
# Background: Networked RFID



Standards developed to support each stage: *EPC Network* ([www.epcglobalinc.org](http://www.epcglobalinc.org))

# EPCglobal and Auto ID Labs

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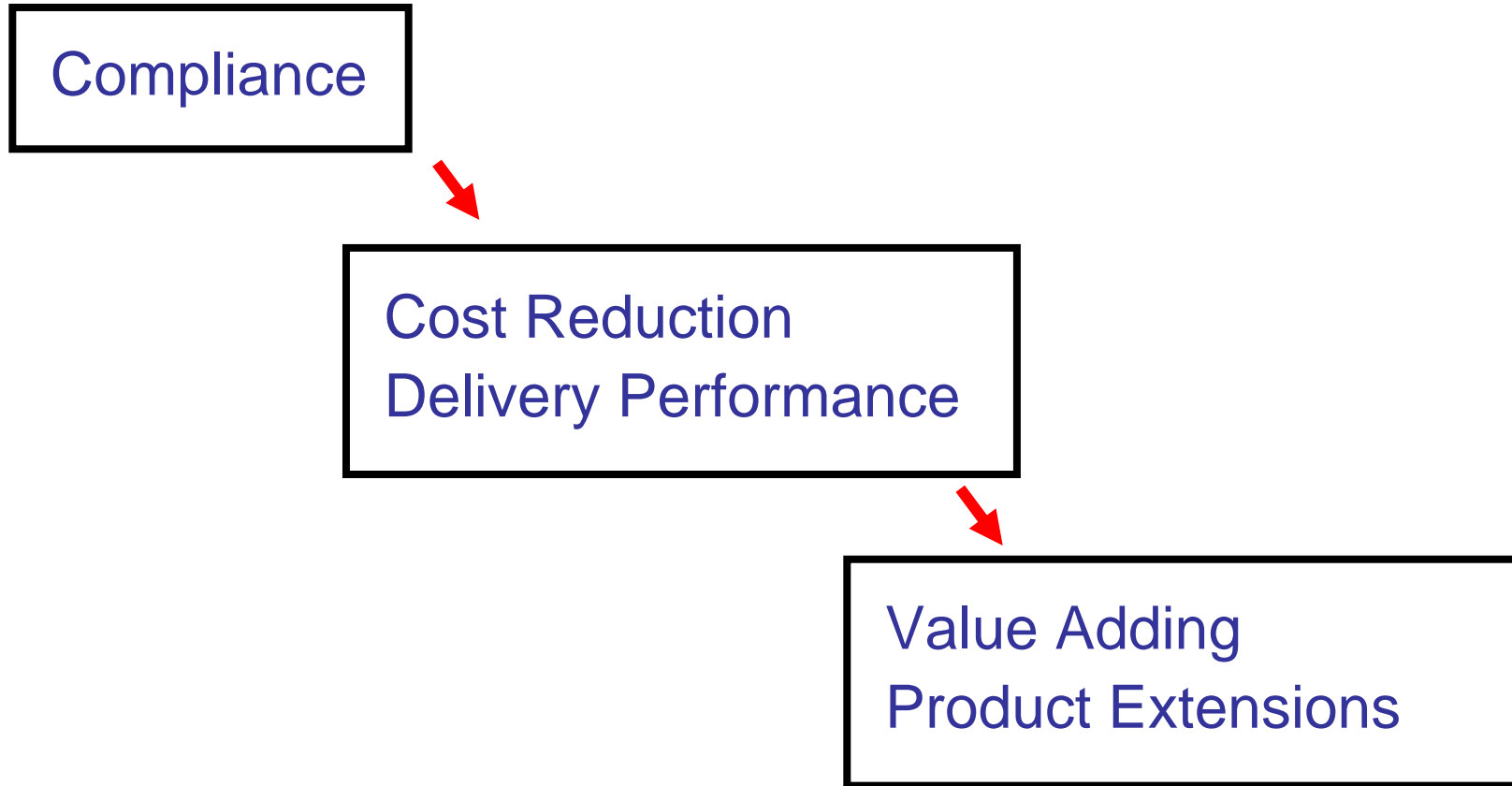


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# Implications for the Supply Chain - Today

# Drivers – *Zero, Short, Medium Term*

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# Supply Chain Applications

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- Multi applications for same system
  - Shrinkage
  - Out of stocks/poor on-shelf availability
  - Traceability
  - Inefficiencies in supply chain operation
  - Managing Demand Uncertainty
  - Reduce Stock Holding Levels
- Multiple Companies using same system
- Very low cost and very high volumes

# Mandates & Influences

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- FMCG/Retail
  - WalMart: By January 2005 top 100 suppliers must use EPC tags on cases and pallets
  - Tesco: Selected product lines to be tagged starting Sept 2004
  - Also Target, Albertsons, Metro
- Defence: *All DOD* suppliers to use RFID by January 2005 (active/passive mix)
- Aerospace: Boeing/Airbus announcement
- Automotive: Automotive Associations examining
- Other influences: FDA, Pharma, Food Traceability, Recycling legislation

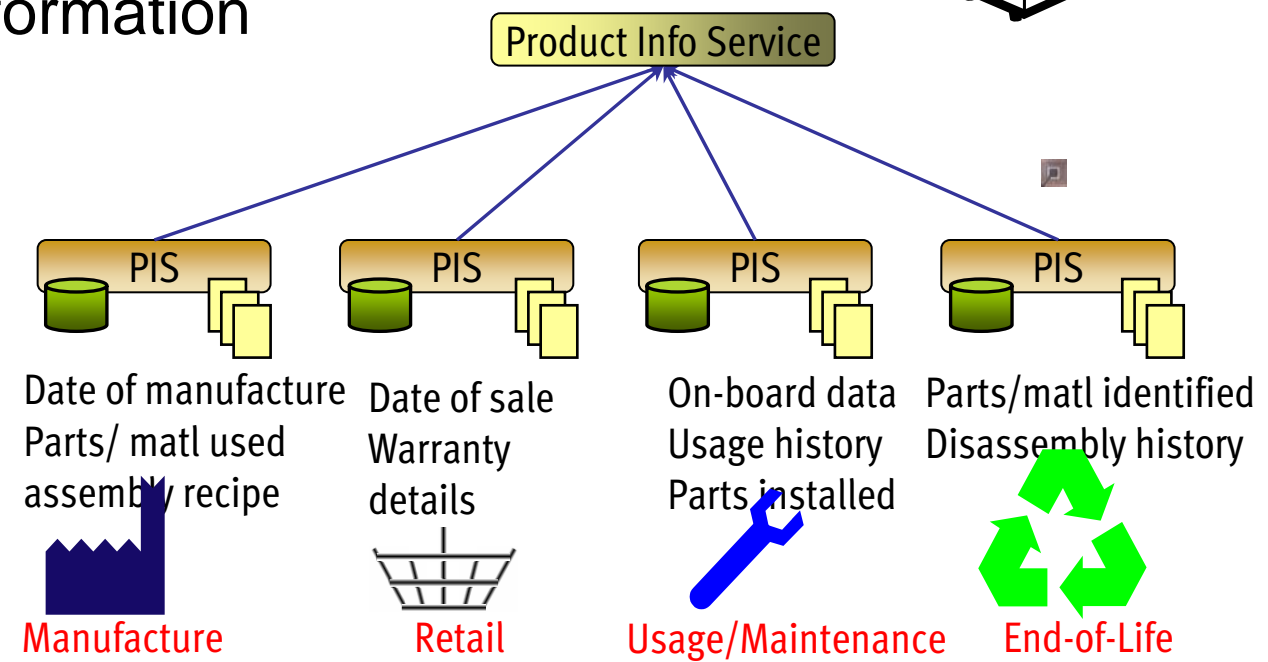
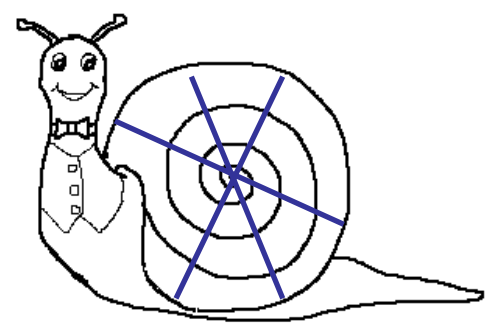
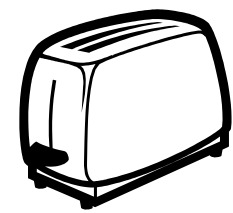
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# Implications for the Supply Chain - Future?

# An Information Rich Supply Chain

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The product as a self contained unit comprising all physical capabilities and information support



# Information Rich Products

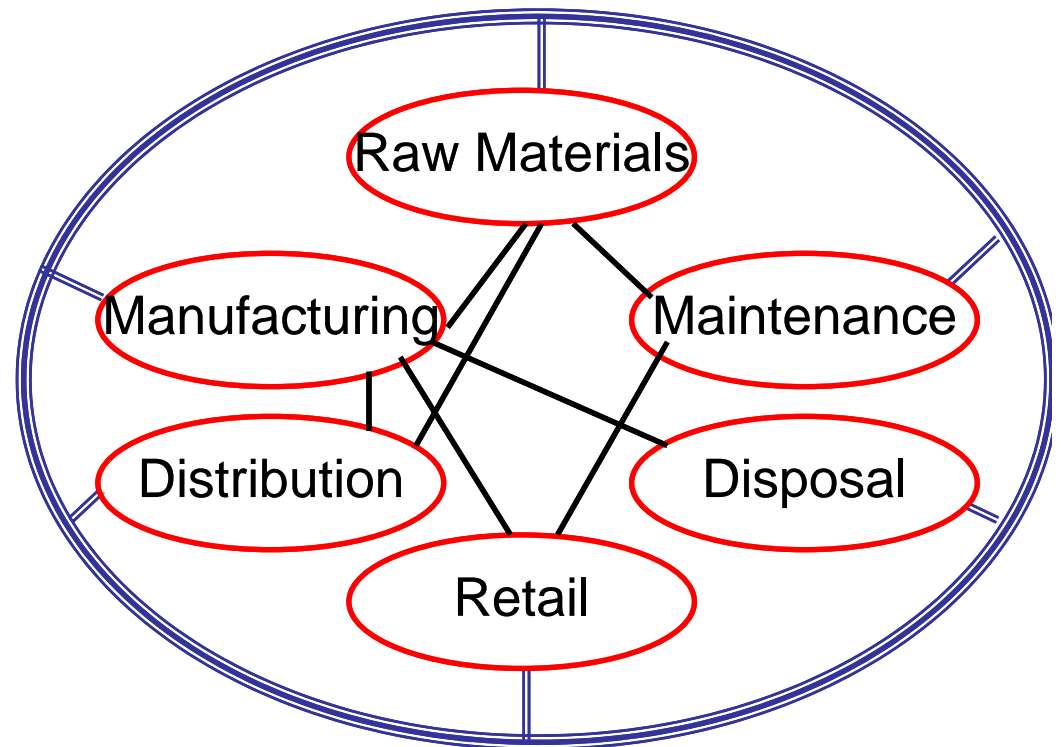
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## *RFID Role?:*

Provision of unique ID  
pointer to networked data

## *Why Revolutionary?:*

Entire rethinking of SC  
data management



SC Data Service

# Supply Chains for Highly Customised Products

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Products made, packed, delivered, displayed based on a specific, unique user need



*Role for RFID?* Ensuring instructions are uniquely & tightly linked to physical components, products, equipment.

*Why revolutionary?:* embed consumer directly into supply chain

# Service & Support Supply Chain

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Products increasingly linked to service agreements – leasing models, domestic and low cost industrial products included

## *Role for RFID?*

Service reference point,  
coupling with other sensors



## *Why revolutions*

open loop =>  
closed loop appliances



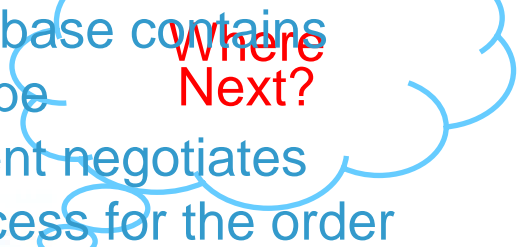
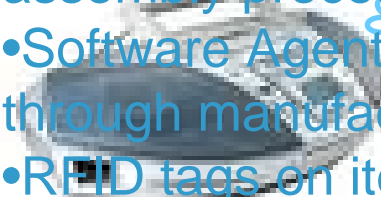
# Enabling Self Managing Products

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Embedded or networked product intelligence enabling designs, products, orders to manage their own make, move, use, dispose functions

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- Product data base contains assembly recipe
  - Software Agent negotiates assembly process for the order
  - Software Agent escorts products through manufacturing
  - RFID tags on items, containers and shuttles ensure perfect synchronisation
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# Summary

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- RFID is simply a sensor
    - Effective coupling with other sensors is needed
    - Effective integration with information / control systems is critical for benefits
    - Part of a bigger Product Information Management issue
  - Value of Sensing
    - Hard to quantify
    - Much of the focus today is cost reduction
    - Benefits in reengineering of supply chain