Practical Implementation of RFID for Driving Ubiquitous Information Society

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Ubiquitous Society with *Networked RFID*

Secure & Easy access from anywhere and anytime to identify and authenticate every object from anyone

Car/Railway

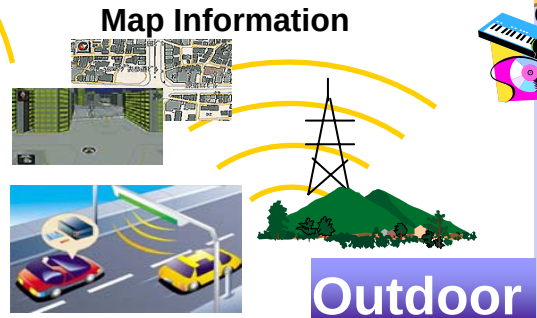
Mobile

Office

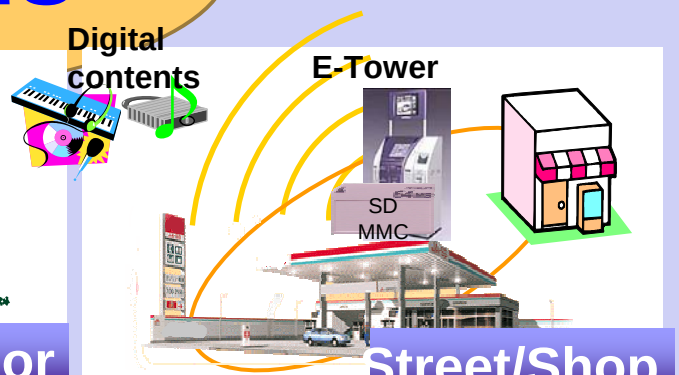
Ubiquitous

Home

Outdoor



Street/Shop



Service and Concerns
in Ubiquitous RFID Applications

- To realize **Secure and Easy access services** from anytime, anywhere, anyone and anything

- RFID applications and new business models are related to many items such as services, network architecture, **security**, **privacy** and even for **human lifestyle & culture**

- The essential part should be how can RFID solutions meet the **User Requirements and Public Expectation**

- To add value to the existing market situation both in the upstream processing industry and for downstream consumers
  Ex. **Traceability** in Food Chain and Medicine
  Prevention of Counterfeit & Copy products

Current topics in the Food Market

Increase in Customer Concerns

1. Diseases	**BSE, Chicken Fever**
2. Contamination	**Virus, Food Additives, Chemical remainders**
3. Security	**Anti-counterfeit**
4. Quality Assurance	**GM food products**

e.g. Regulation and Standardization in Japan

- **Food Safety Law**
- **Production record ＪＡＳ(Japanese Agricultural Standard) Law**
- **Beef Traceability Law (Dec 2004)**
- **ＨＡＣＣＰ（Hazard Analysis and Critical Control Point）**
- **ISO２２０００（Food Safety Management System）**

Individual Pig Tracing tag with μ-Chip

μ-Chip : 2.45GHz world smallest RFID

- What brand
- How to breed
- Which farm
- When to be inspected
- Weight gain
- Feed characteristics
- Medical records
- Statutory compliance

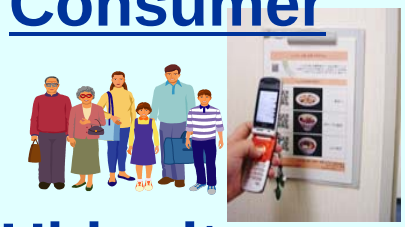
Traceability in Future Food Chain

Farm/Maker
Origin
Produce
Processing
Shipment

Distribution
Sorting
Inspection
Labeling
Delivery

Market/Store
Arrival
Inventory
Quality
Inspection

Consumer



Ubiquitous Access to Product/Food Information

Information

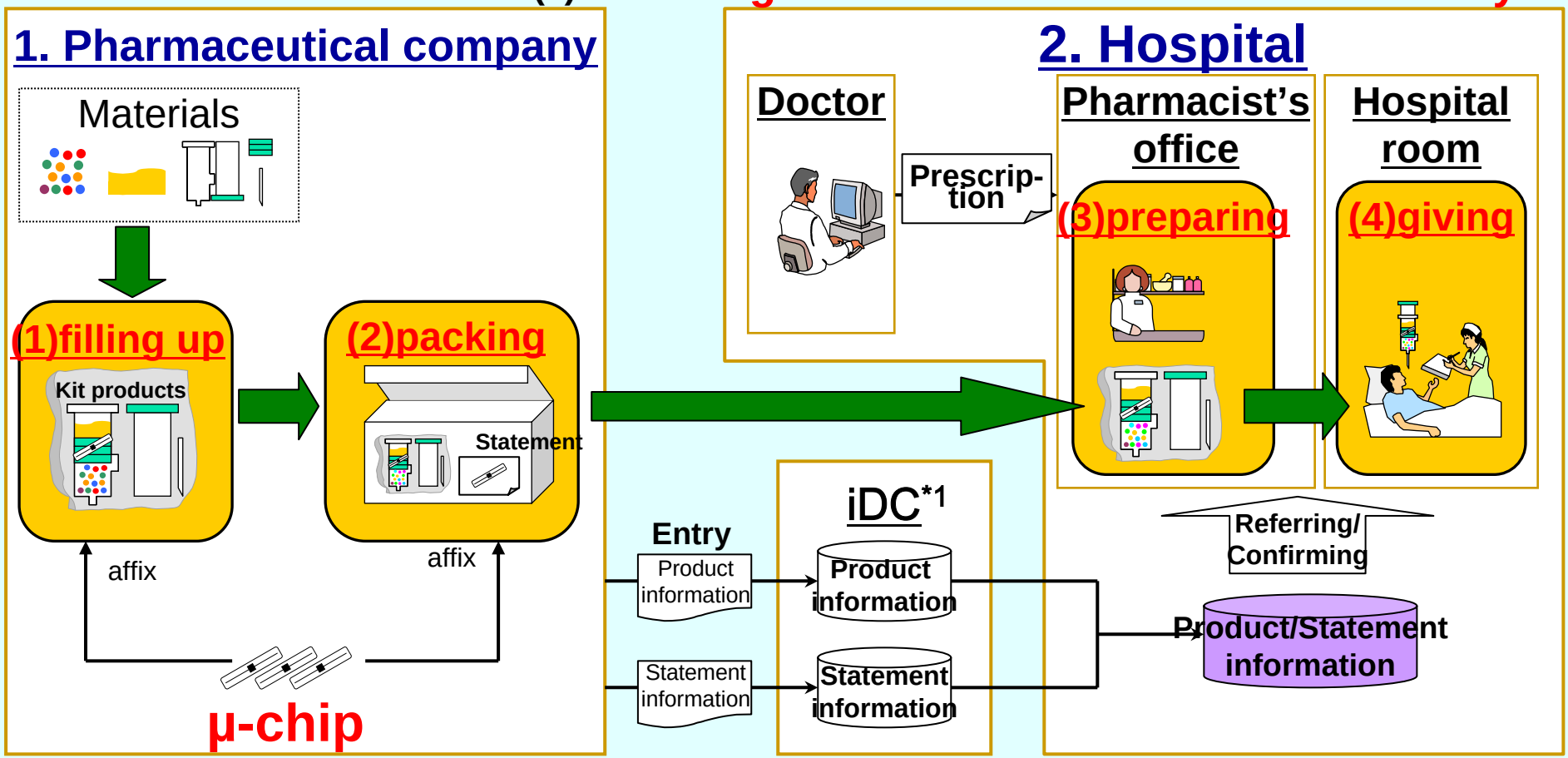
Production & Distribution history

Traceability DB

Customer Concerns
-Disease (Bird full)
-Contamination
-Security
-Quality (Freshness)

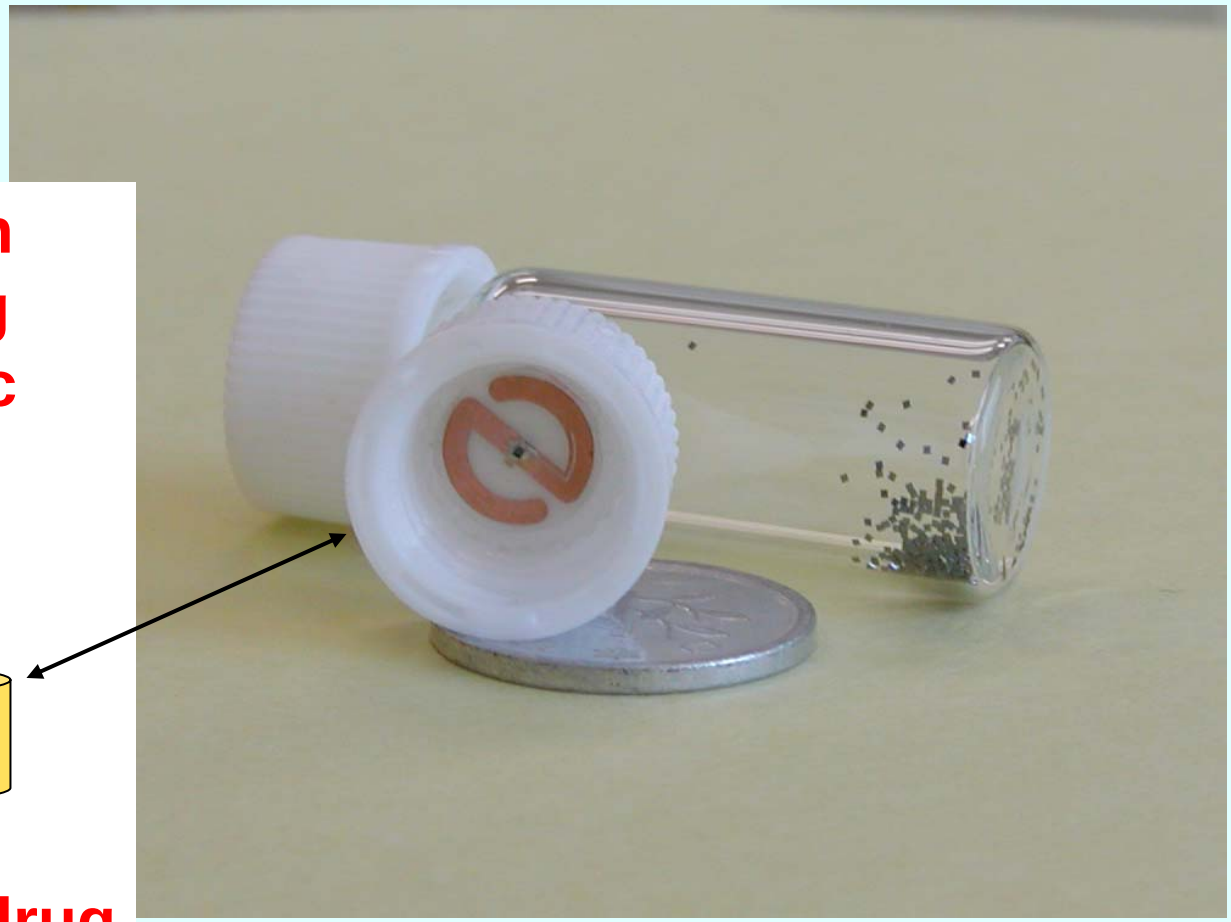
Medical Solution (Prevention of human error)

1. Pharmaceutical company: (1) Product information for each package
   (2) Checking miss-packing
2. Hospital: (3) Checking medical effects or combinations
   (4) Checking medical effects or terms of validity



*1:Internet Data Center

Item Tagging of Small Medicine Package



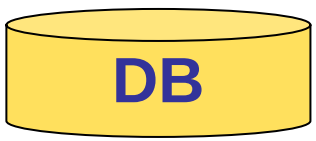
“S” shape pattern small antenna tag (molded in Plastic Cap in future)

Product DB

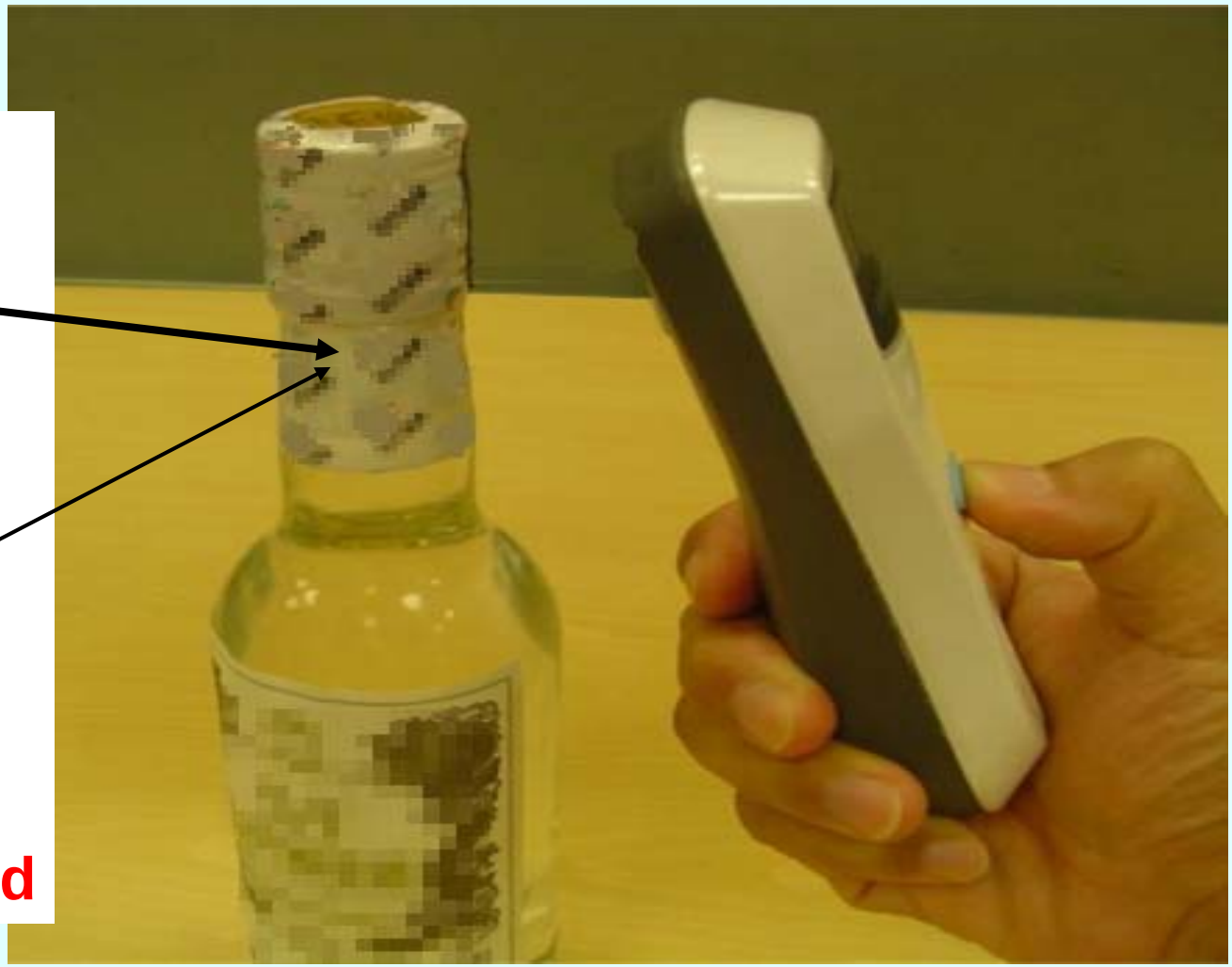
To identify each drug validity through Data Base

Anti-counterfeit Prevention for Liquor

Liquor label with fragile antenna (not to be reused)



To identify original brand



Tool and Implement Management

Prevention of missing Tools *item level*
for your safety and secure construction

"Tool Guard" Package System

1.Attaching RFID unique ID to each Tool with on-Metal application Tag

2.Check Tool IDs before carrying out

3.Confirm each ID & number of Tools after usage

Certified Tag for Fire Sensor

For checking terms of validity of Battery for use of periodic Inspection and Maintenance service

DB*

*Authorized by Japan Housing Corporation

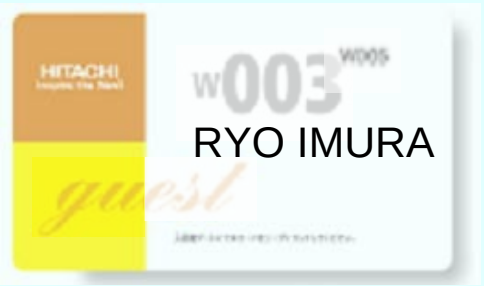
Sample Tag for CD/DVD Authentication

To identify the Disc for rental service
(it also protects illegal copy of contents)

e-Ticketing system for Railway Service

Ticket issuing

Reception

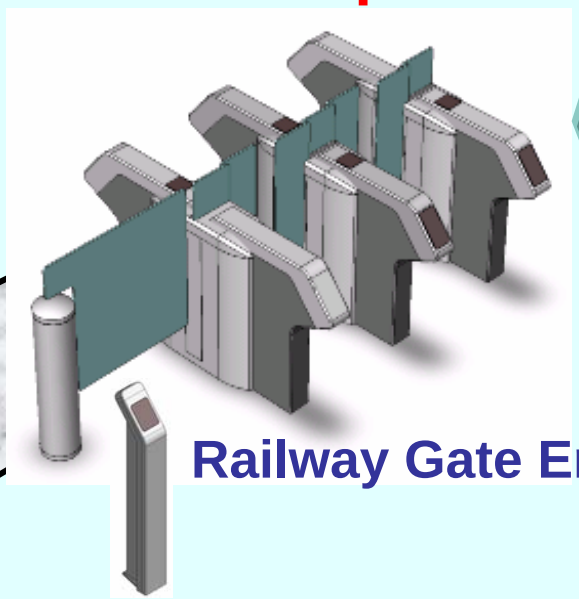


Railway Pass installed IC chip

Common use for Railway, Bus and Subway
also used for shopping

Charging

Terminal



Railway Gate Entrance

Mobile RFID Reader

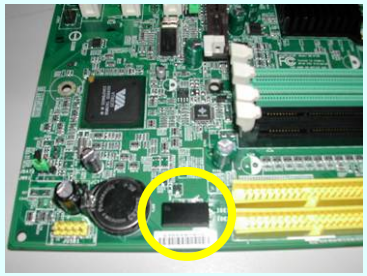
Key device for Ubiquitous Network Access

Prototype Reader embedded into cell phone

μ-Chip RFID reader and cell phone combined with Bluetooth

Product Lifecycle Management (PLM)

For Reuse and Recycle system



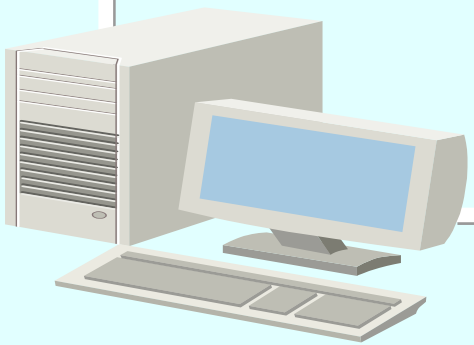
Put customized **µ-chip tag** on the PCB

Quality control and tracking by reading µ-chip tags

Distributors/retailer can verified the product and get product Information by reading µ-chip tag.

Intranet

Internet



Data control center

feedback

Service engineers can verified the product and get information By reading µ-chip.

Why is RFID heating up NOW ?

Social Demand / Customer Needs

- Security/Safety
- Reliability/Quality control
- Environmental protection
- Recycle/Lifecycle/Traceability

User Needs

- Recover Opportunity Loss
- Efficiency Improvement
- More Cost Reduction
- New Value for Customer

Attention to *Auto Identification* & *Authentication* in *Ubiquitous Network*

Evolution of RFID Technology

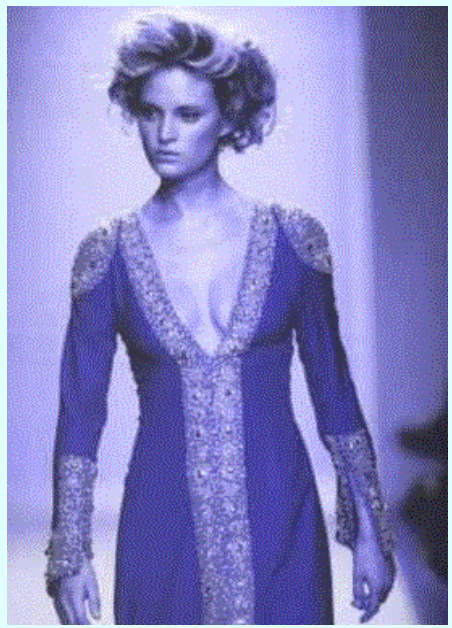
- Identify huge number of items
- Acceptable performance

Miniaturization
Cost reduction
Stable volume supply

High Expectation for RFID Technology

Retail SCM Solution

- To track and trace products through the Supply chain
- Retail Stores
  - Collation of arrivals at entrance with Box scanning
  - Inventory control
    (e.g. Expired date control in stock and store)
  - Products authentication at refund
- Brand protection tracking and authentication



UHF band RFID for Open SCM use

(ISO18000-6)

Privacy Protection Scheme

by “Secure RFID” (post-HIBIKI) Project

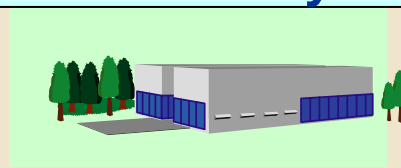
Retail Store

Sales

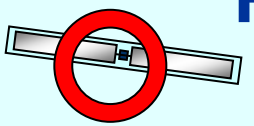
Consumer

Consumption

Reuse & Recycle

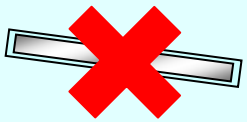


RFID tag

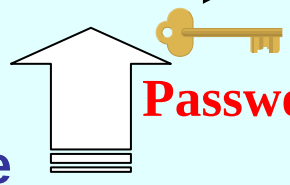


Readable

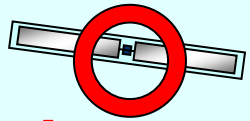
Password



Unreadable or
Reduced Read Distance



Password



Readable

Deactivation

Reactivation

ISO18000-6 Type C
Current specification
“Kill Command” =
Permanent Deactivation

New Feature planned by post-HIBIKI
“Secure RFID” Project
Password operation enables
Deactivation & Reactivation
in addition to Kill Command

User Data Protection scheme

by “Secure RFID” (post-HIBIKI) Project

ISO18000-6 Type C

Tag memory

- Reserved
- UII Code Bank
- TID Code Bank
- User Data Bank
  - Manufacturer
  - Distributor
  - Retailer
  - . . .

Whole User Data Bank access is protected by the Lock function

Multiple User Data Banks Area can be defined

“Secure RFID” Target Spec.

Tag memory

- Reserved
- UII Code Bank
- TID Code Bank
- Area#1 Manufacturer
- Area#2 Distributor
- Area#3 Retailer
- Area . . .

Tag memory can be protected based on individual User Data Bank Area, either permanently or by a defined Password

SCM for "Open" Industry User

"Beneficiary" may not always be the "Cost payer"

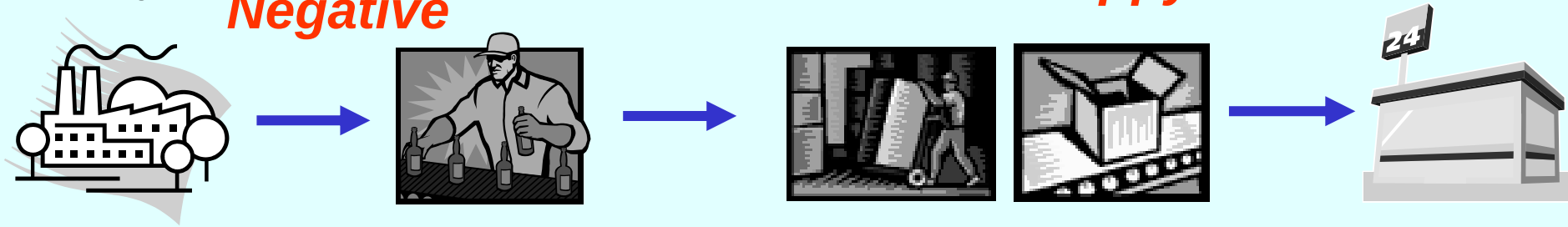
No Direct Benefit by tagging

Mismatch!

Clear Benefit on SCM

Negative

Happy & Positive



Material Supplier **Processing** **Warehouse** **Distributor** **Retailer**

Tagging Cost

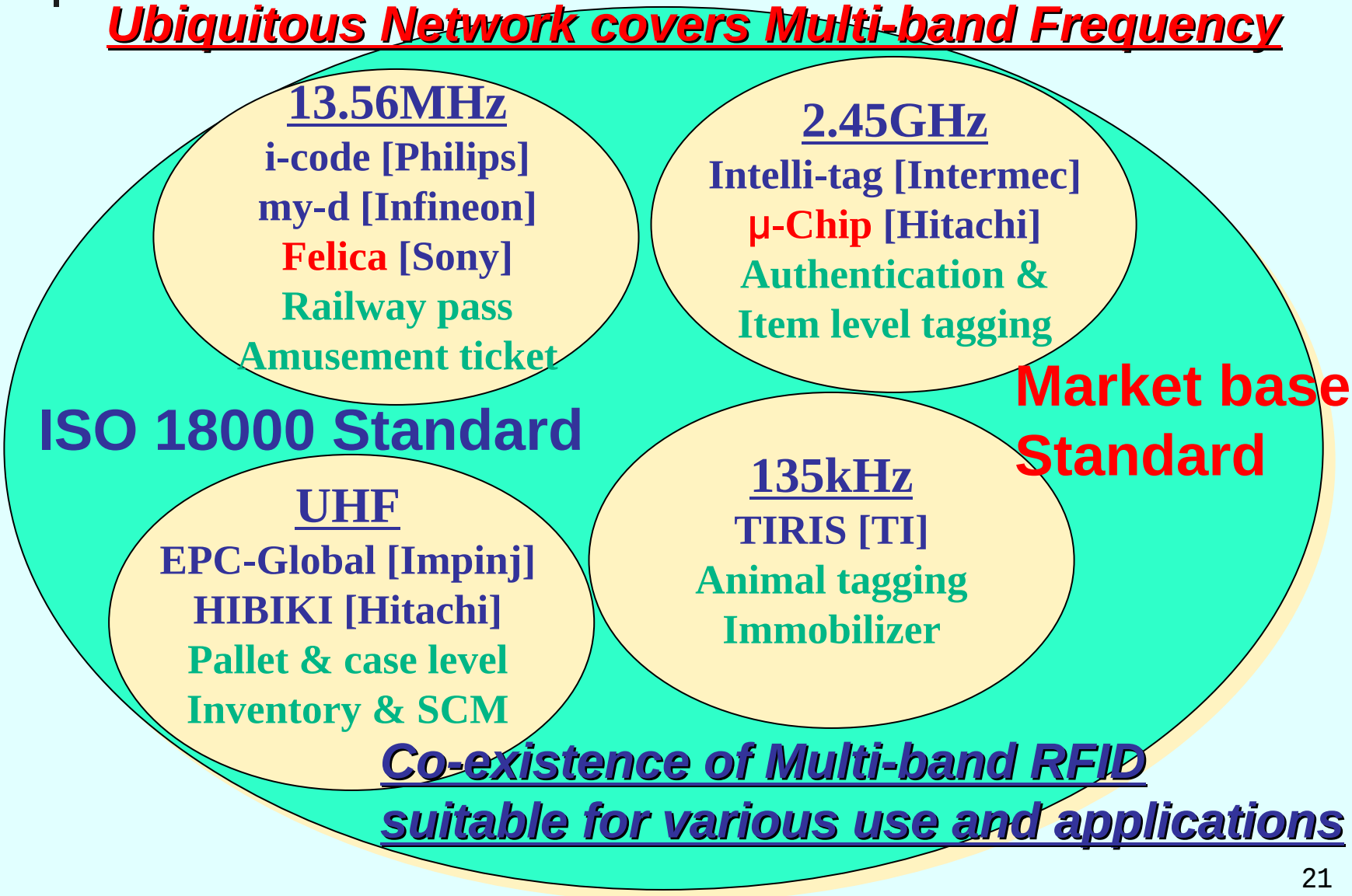
System cost & Operation Cost

Operation Improvement & Cost Reduction

"Beneficiary" ≠"Cost Payer"
Who is the "Decision Maker"?

****Mechanism for cost-sharing and balance the costs and benefits***

RFID Product Position and Standard



Ubiquitous multi band Reader

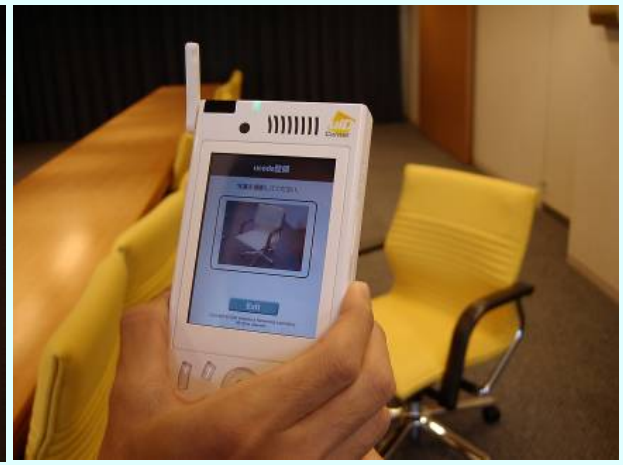
- Several types of Ubiquitous communicator
  (common for both 13.56MHz & 2.45GHz)

PDA type

Business UC

μ UC

- U-ID Evaluation Kit
  - ◎PDA type reader and authorized U-code tag with U-ID software
  - ◎Network connection with U-ID data center for linking system operation

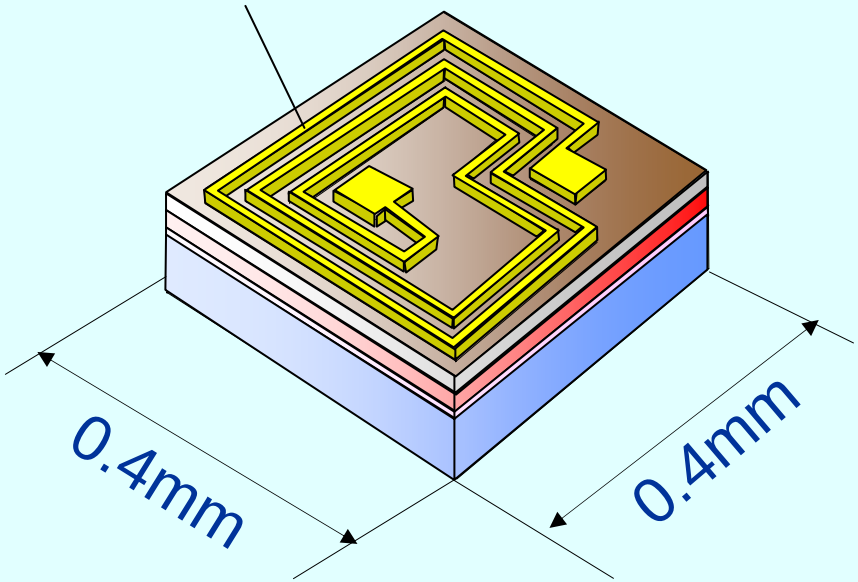


Joint activities for Traceability Implementation

Industry, academic, government promote strongly various activity for utilization
- Driven by e-Japan strategy-

Future Technology

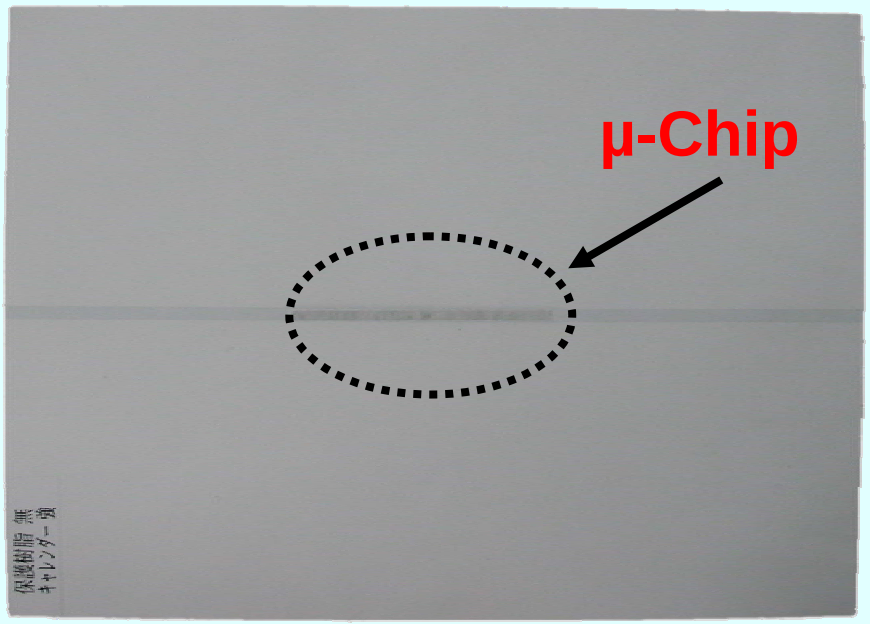
2.45GHz embedded antenna



Ultra-small Embedded Antenna type **μ-Chip** worked as RFID Tag

μ-Chip

Original Concept : Anti-counterfeit of Banknote and Direct embedding into Paper Media



For example : Banknote, Certificate, Voucher and Document control etc

Over the coming 10-20 years

ROAD MAP

--- Low cost tag & reader
--- System operation
--- Proliferation of devices [mobile phones with RFID readers]
--- Sensor Network (Location system, temperature tracking etc)
---Embedded technology
---Networked RFID

APPLICATION

- Railway pass
- e-ticket
- e-Pedigree
- Recycling
- Passports
- Citizen Cards
- Contact-less Payments
- Food packaging
- Banknote
- Smart Toys

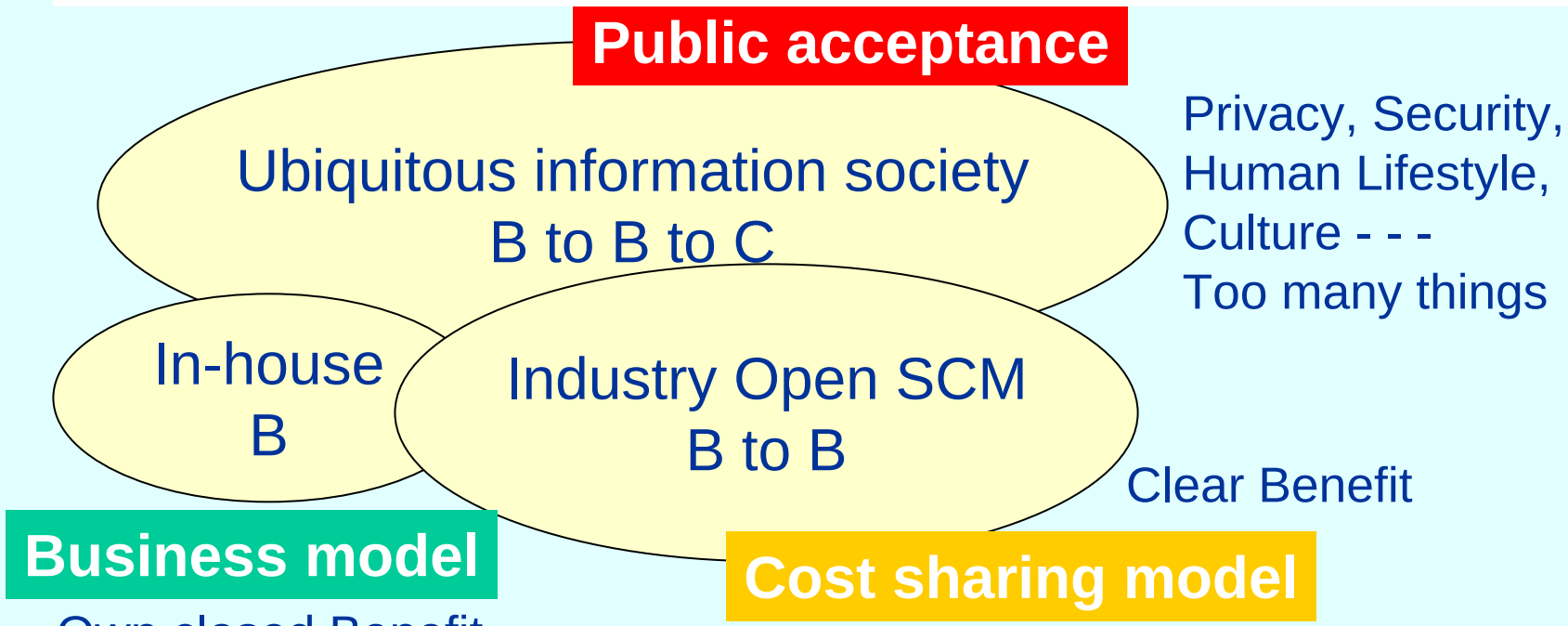
EVOLUTION

In-house (Production FA, QA)
SCM (Palette & Case)
Authentication (Item level)
Product Lifecycle Management
New Mobile Device Business Models

Essentials for RFID Revolution

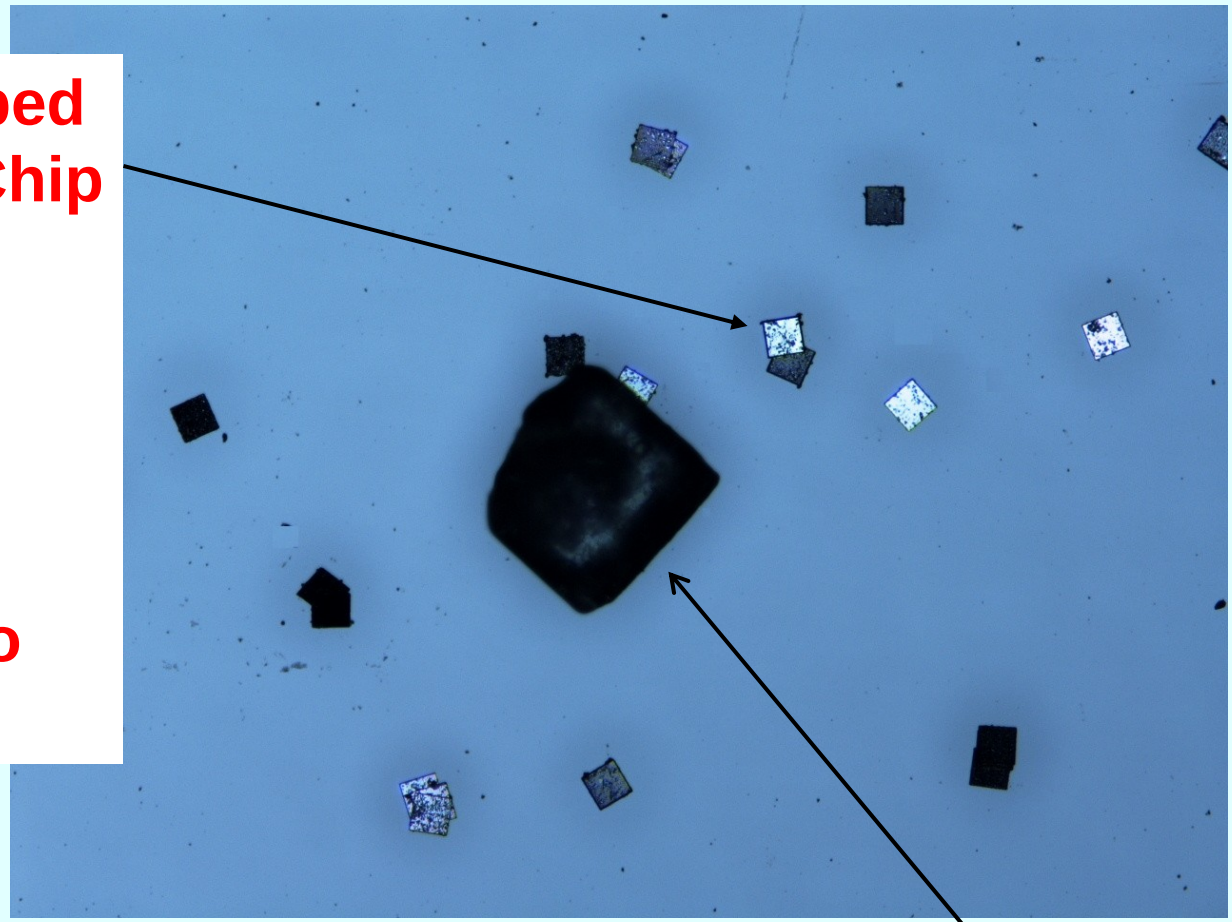
To the next step :

- **Common understandings for Public acceptance**
- **Feasibility Test to show the clear Benefit for both Industry users and Customers**
- **Innovative Technology Development by Government, Industry and Academia**



Recent Topics

Newly developed ultra small μ-Chip size of 50μm x 50μm thickness 7.5μm For directly embedded into paper media



Compared with crystal of granulated sugar