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International Telecommunication Union

Networked RFID for use in the Food Chain

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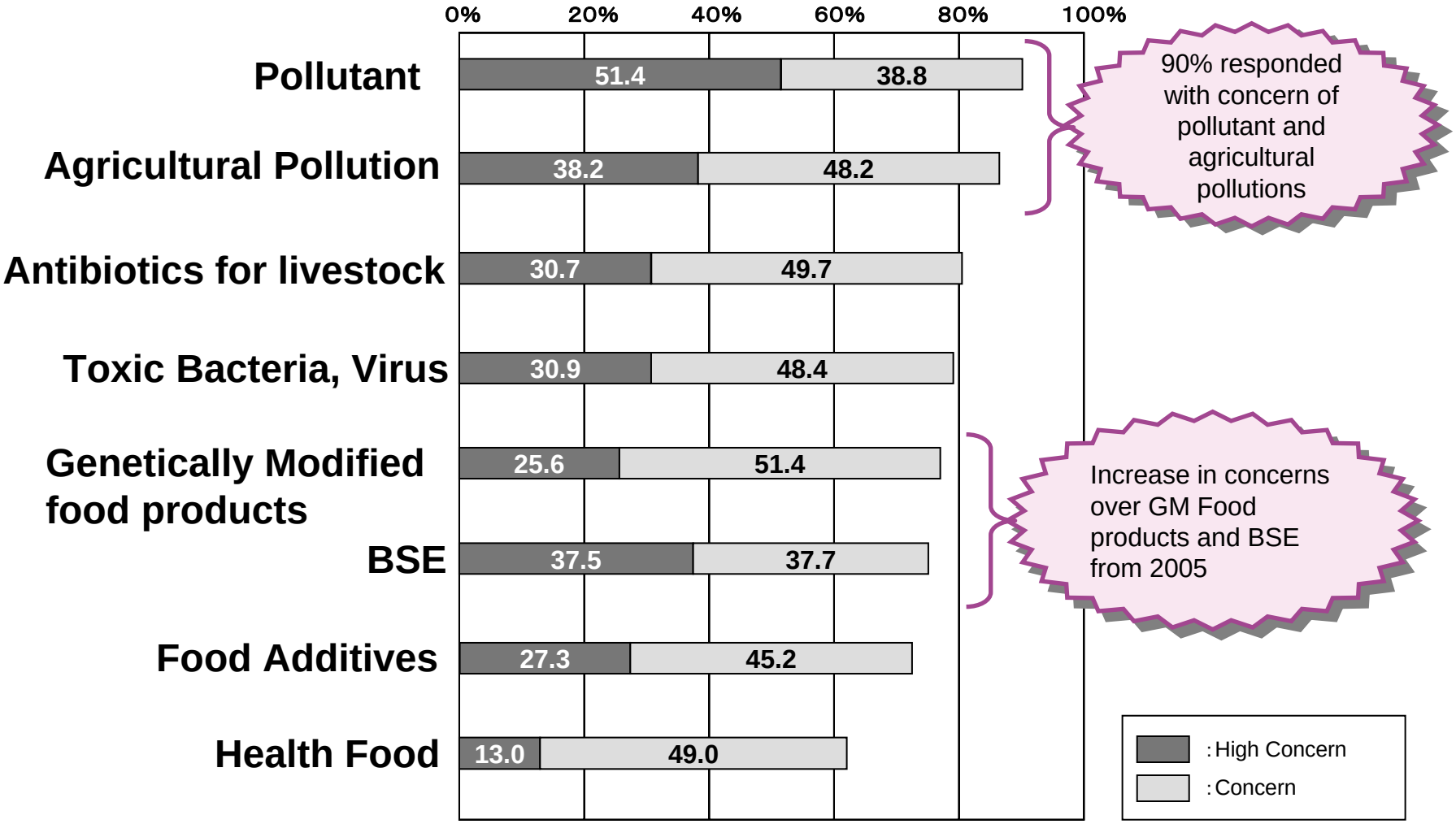
Hitachi Europe Ltd.

ITU-T Workshop "Networked RFID: Systems and Services"
Geneva, 14-15 February 2006

1-1 What are the issues ?



Survey results for Food safety awareness by Food Security Bureau Japan(May 2005)

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1-2 Present Focus in the Food Market in Eastern Asia

Increase in Customer Concerns

1. Diseases	BSE, Chicken Fever
2. Contamination	0-157 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)
- ISO 22000 （Food Safety Management System）

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1-3 Recent Topics in Japan regarding RFID adoption

- Traceability of Crops with ID Tags
  - August 15th 2004 – Nikkei (Japan Economy) Newspaper
  - Ministry of Agriculture and Crop Traceability
- Application of IC Tag for Trade Procedures to ASEA countries
  - September 20th 2004 Nikkei (Japan Economy) Newspaper
  - Trade System to promote customs efficiency
- Asian Standardisation of IC tag Infrastructure completed in:
  - Japan, Korea, China
  - December 10th 2004 Nikkei (Japan Economy) Newspaper
  - Common IC tag Infrastructure in 8 Asian countries

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1-4 What can we apply RFID tags to ?

- Livestock
  - Breeding stock, production stock
  - Stock Management: medical records, weight gain, feed ratios etc.
  - Can improve process and avoid manual reconciliation of production data and "printed" numbered tags

- Intermediate Containers
  - Re-usable cartons and trays
  - Boxed items [esp fish, seafood, meats]
  - Pallets
  - Reduce pollution from residues left from bar-code labels [move towards the paper-less tray]

- Premium Products
  - Fish, Meats, Fruits: Carton level and down to individual item level
  - Drinks: Wine, Champagne, Premium Spirits

- Linked with other Sensors to provide end to end transit conditions data
  - Temperature and humidity
  - Damage through mis-handling [g-force]

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1.5 Why do we need Networked Solutions and What is the Value chain ?

- Networked Solutions are required because:
  - There are many players in the chain
    - Producers
    - Processors
    - Distributors
    - Retailers
  - Processing and manufacturing centres are often in geographically diverse locations
  - Managing potentially huge amounts or “item-level” data ion a persistent basis is not the core business of food producing and manufacturing companies

- What is the potential value chain ?
  - Hardware [tag suppliers, reader suppliers]
  - Traditional IT solution components [Servers, storage]
  - Network services [Telecoms operators]
  - Software applications [Software providers]
  - System Integrators
  - ASP services

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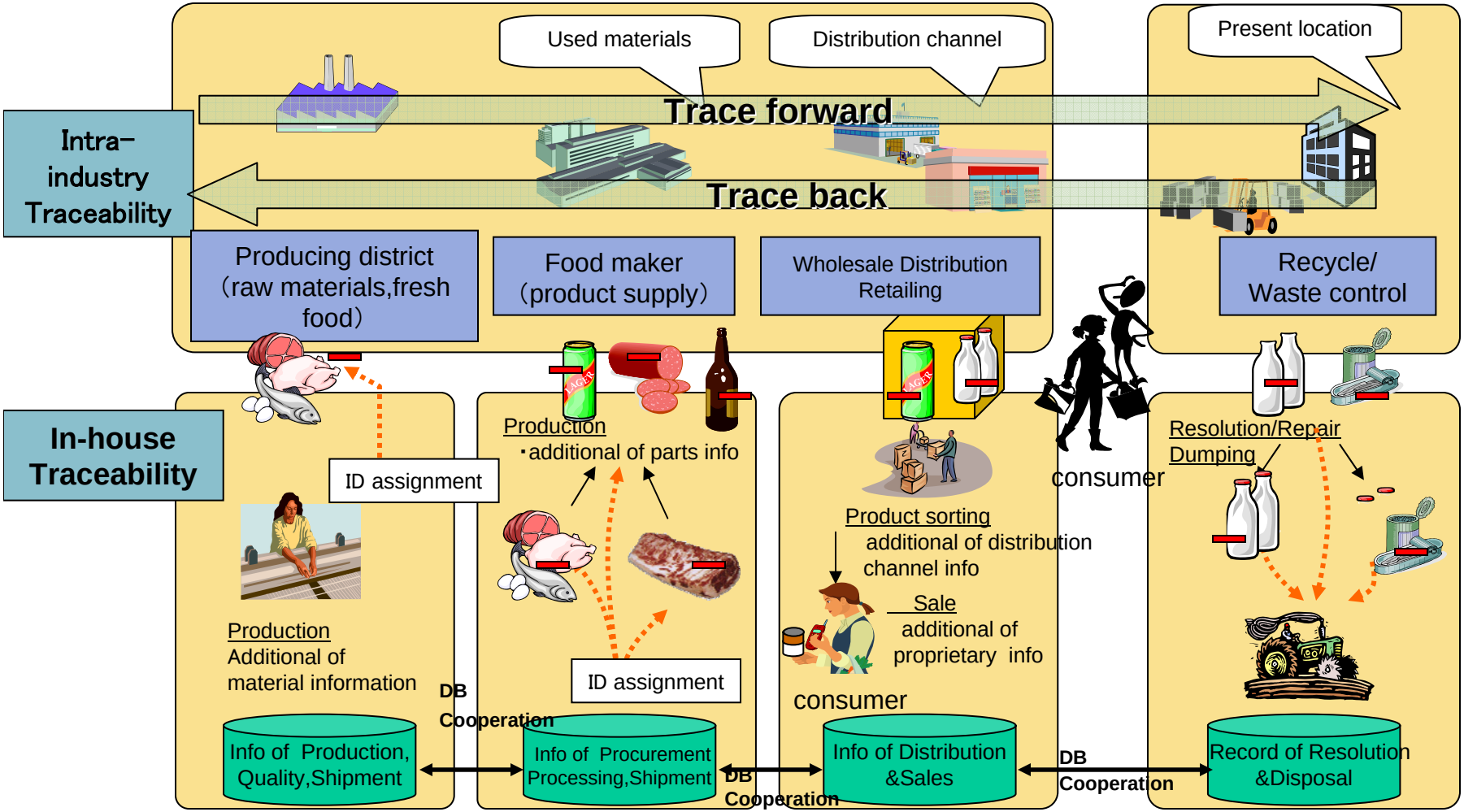
2-1 Overview of Traceability Structure for Food Products

- Trace-forward：confirm planned progress and distribution
- Trace-back: confirm product circulation



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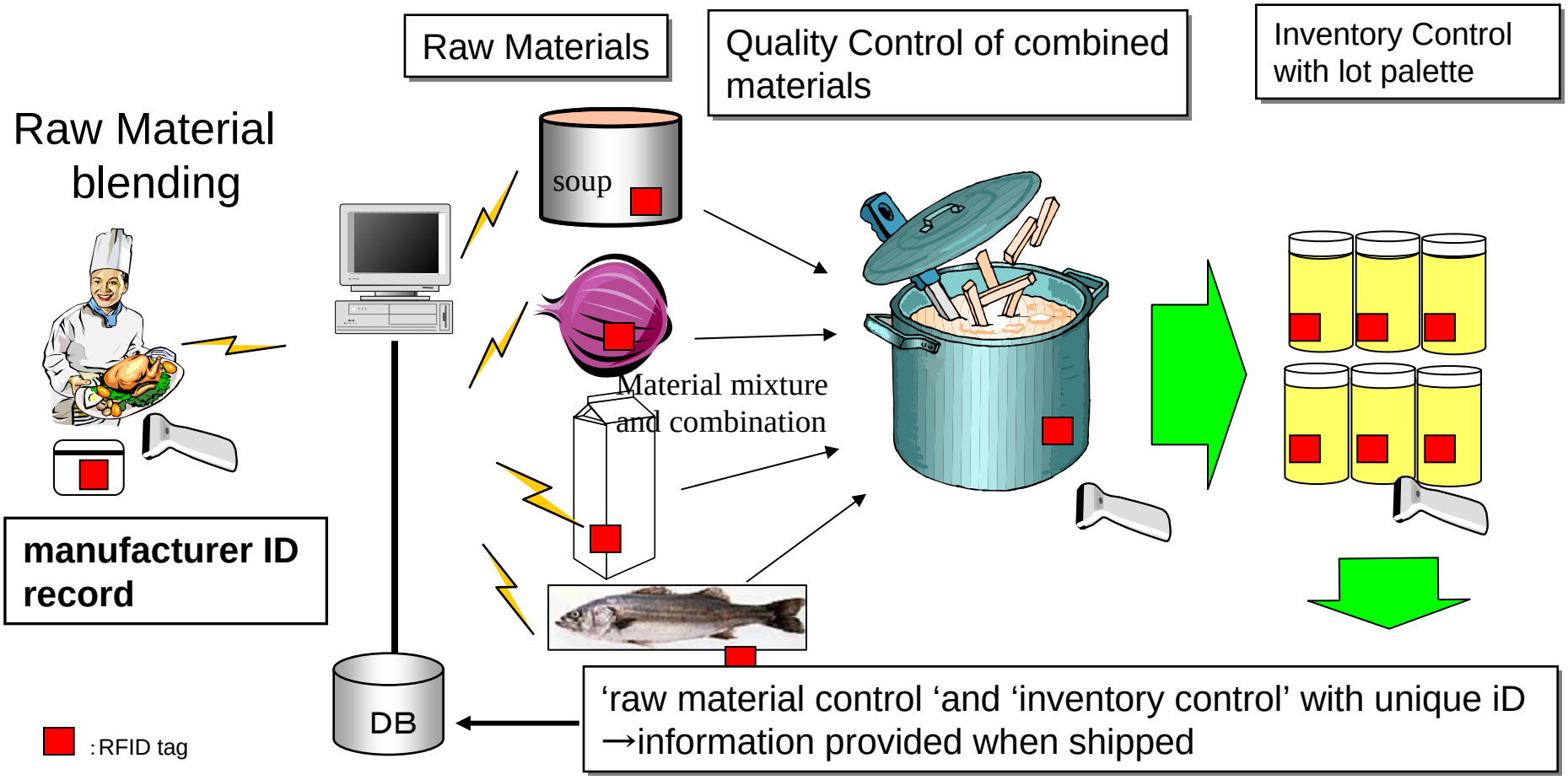
2-2 Production / Quality Control

■ Support System for Food Material Combination



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2-3 Tracing in the Distribution Channel

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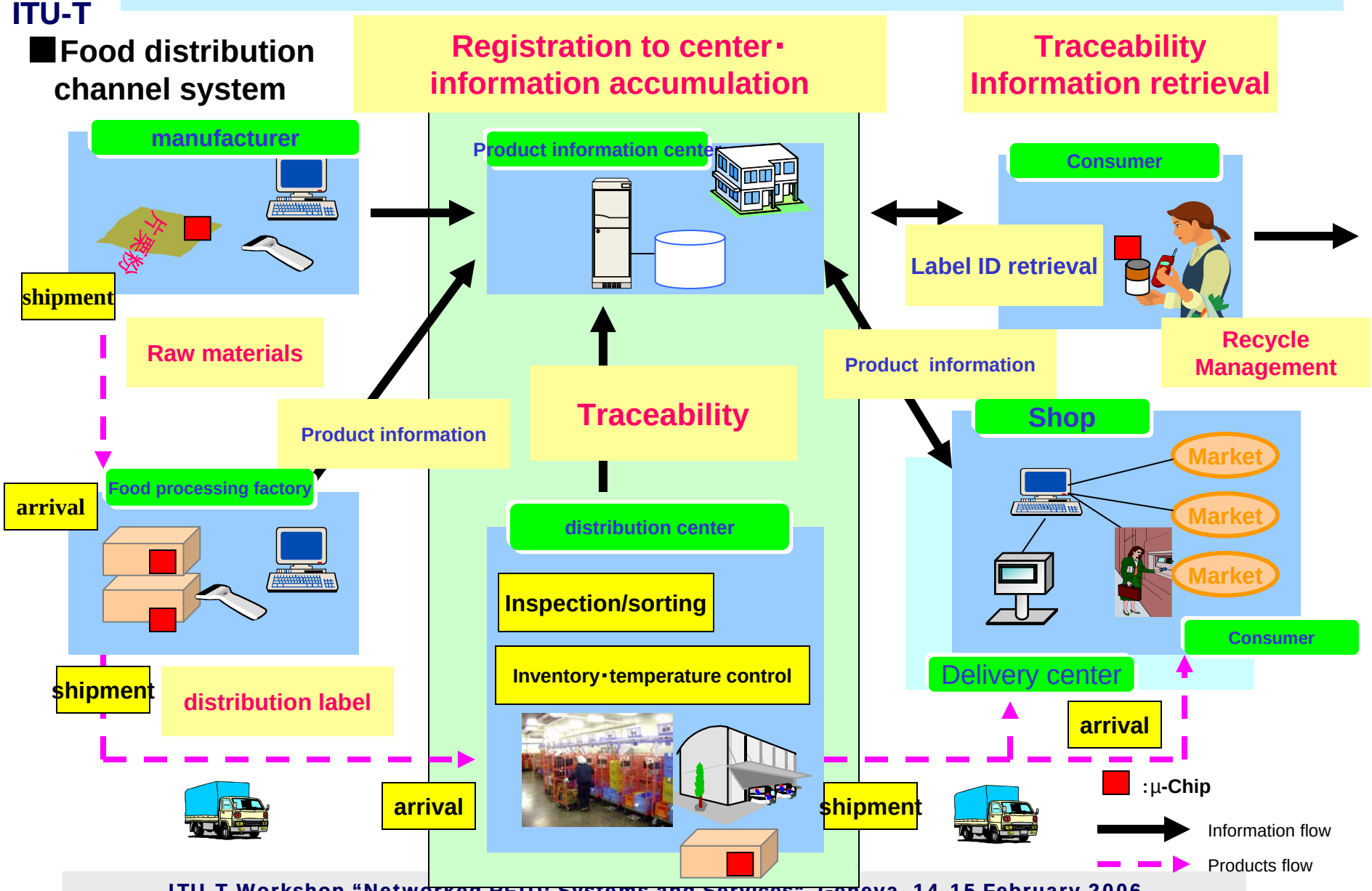
■Food distribution channel system



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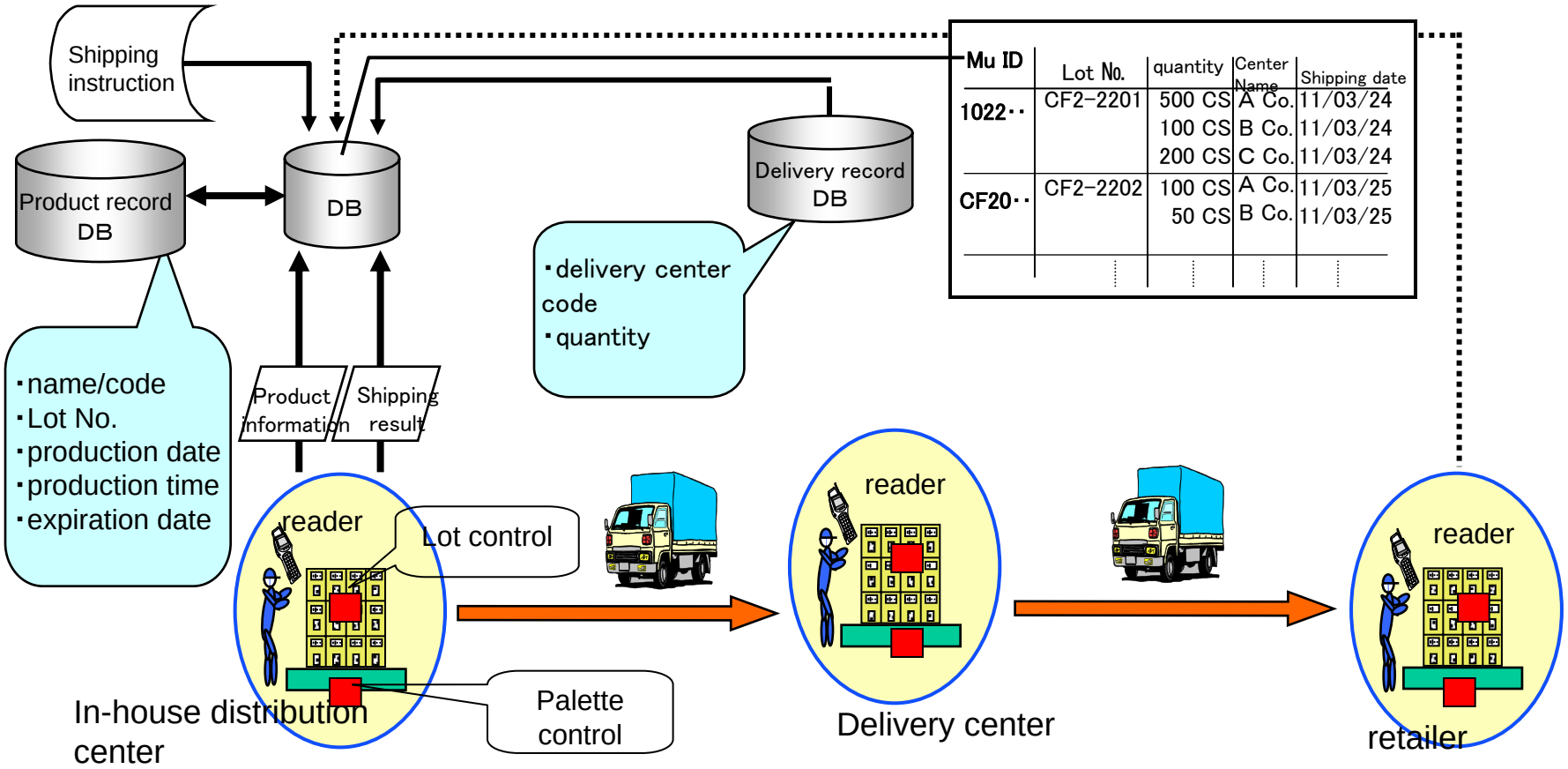
2-4 Tracking System

◆ Manufacturing date, expiration date,customer data base in product lot level for tracing

●speeding up collection of products in case of recalls.
●speeding up response for customer inquires.



Mu ID	Lot No.	quantity	Center Name	Shipping date
1022・・	CF2-2201	500 CS	A Co.	11/03/24
		100 CS	B Co.	11/03/24
		200 CS	C Co.	11/03/24
CF20・・	CF2-2202	100 CS	A Co.	11/03/25
		50 CS	B Co.	11/03/25
	⋮	⋮	⋮	⋮

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2-5 Stage 4: Anti-counterfeit Protection

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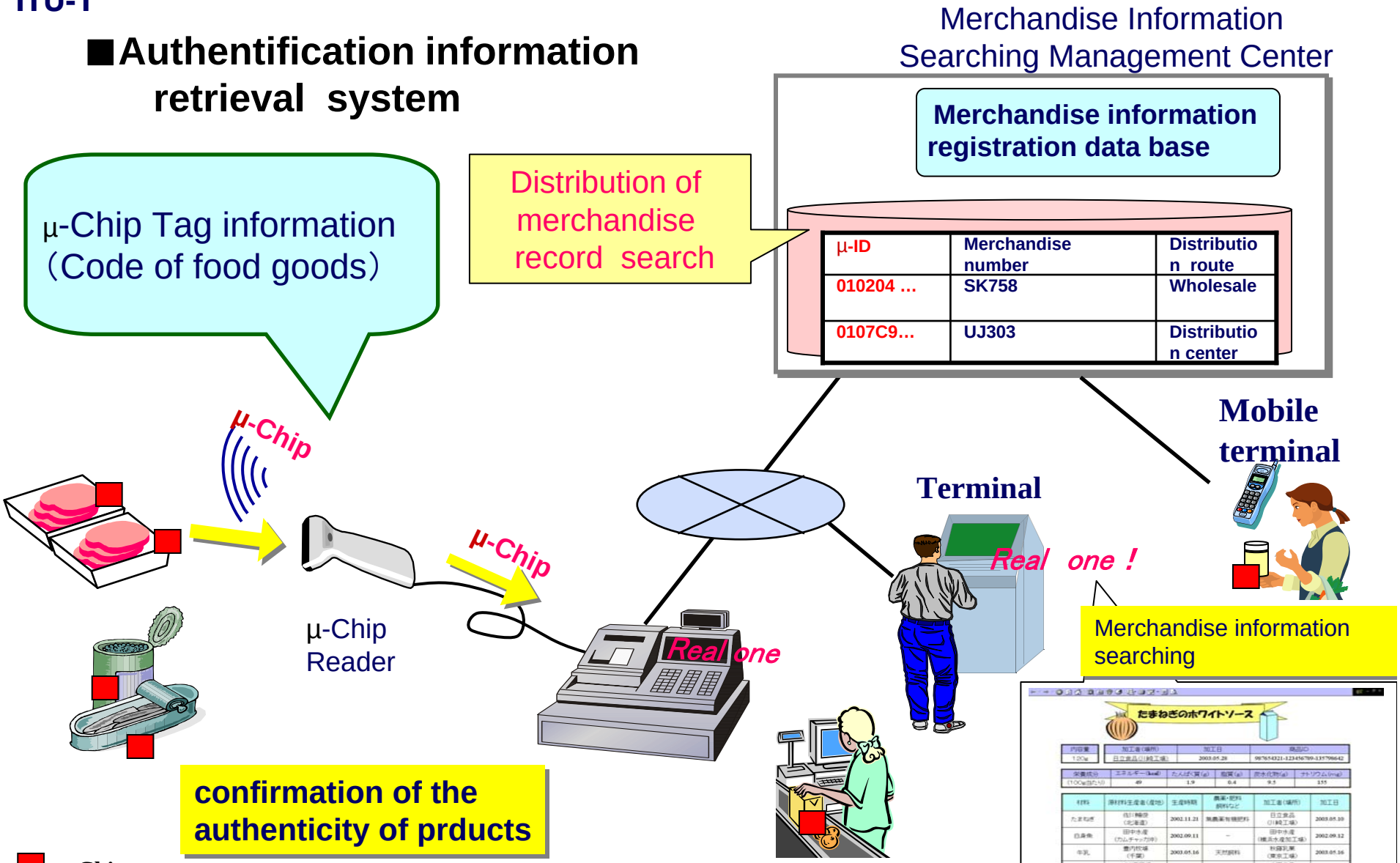
■Authentification information retrieval system



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3-1 Example 1: Production / Quality Control – Animal Tag for Individual Pig Tracing

- What Brand,
- How to Breed
- Which Farm
- When to inspect
- weight gain
- feed characteristics
- Medical records
- statutory compliance etc.

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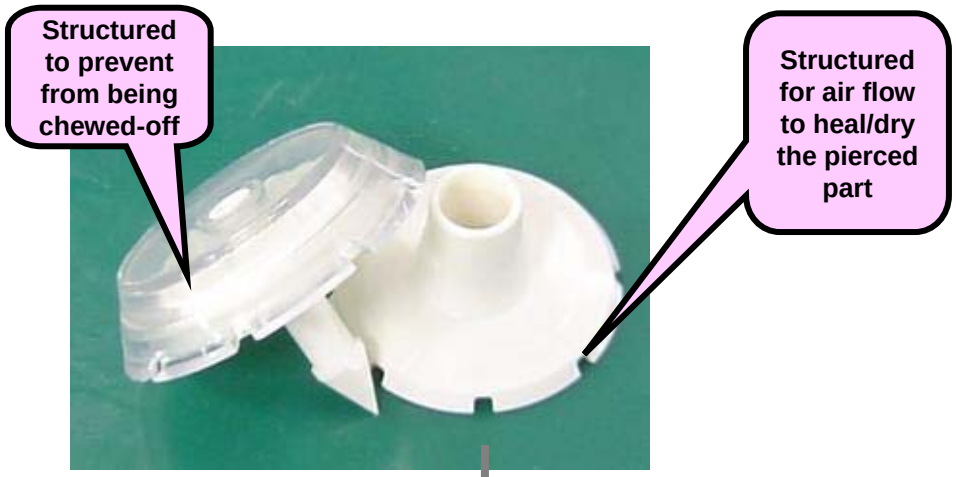
3-2 Pig Tag using the world's smallest IC chip
"μ-Chip"



Requirements of the tags

-harmless, smooth surface
-non-reusable
-durability

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3-3 Introduction to μ-Chip for Networked RFID

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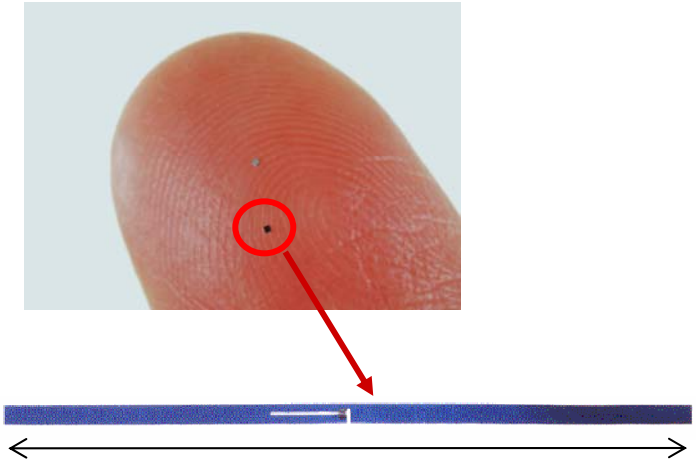
1. Chip Size
   - **World smallest** RFID chip
   - 0.4 mm x 0.4mm x 0.15mm



approx. 50mm

2. **2.45GHz** frequency range

3. Security
   - **Read only** memory (ROM)
   - 128 bits **unique ID #** written into ROM in the chip production process
   - eliminates the write/re-write process to ensures authenticity

4. **Passive** Transponder
   - No power source to maintain the chip (battery-less)
   - Reading distance: approx 30 cm

5. Simplicity
   - Complex functionality enabled through **background system** and database

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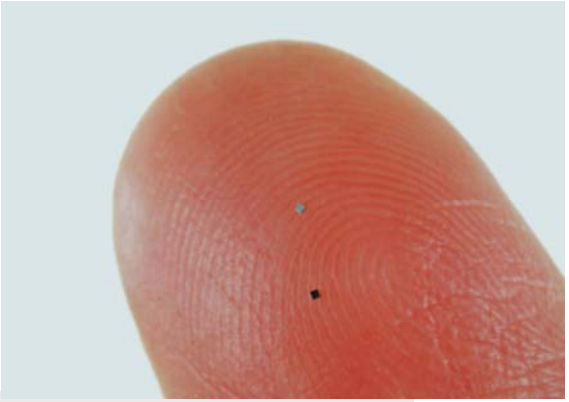
3-4 Why use μ-Chip for Food Traceability

From industry user's point of view:

- High Performance & Clear Benefit
  (**low cost** inlets for **item level** tracking)
- Authentication in Ubiquitous Network
  (ROM-type,non-rewritable)
- Recover sales opportunity loss
  (Simple framework for 'In-house' user)

From end-user's point of view:

- **Security** & **Safety**
- Reliability & **Quality Control**
  (network-base data management)



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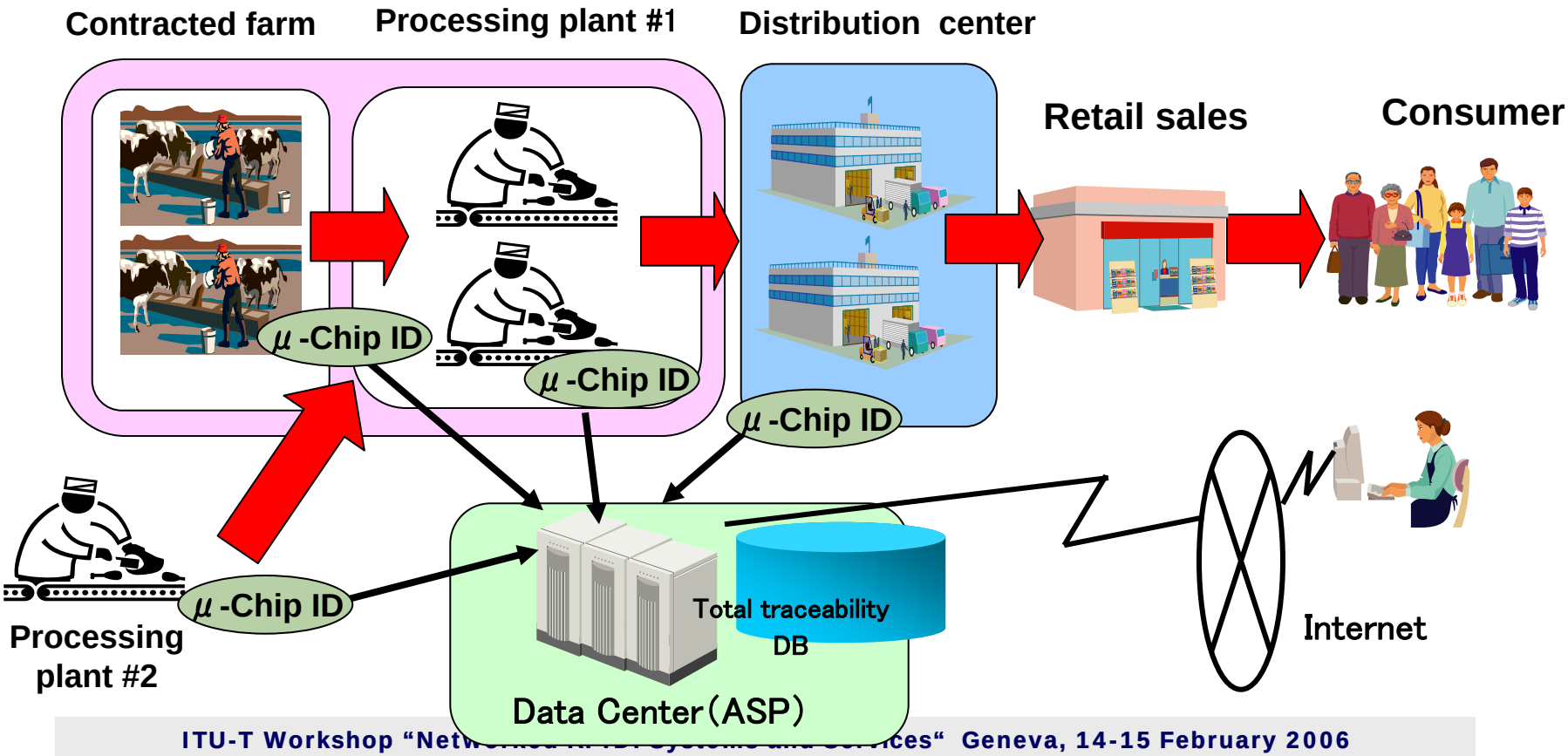
3-5 Example 2: Tracing in the Distribution Channel Adaptation of Traceability in Meat Industry

- In-house control and traceability of fresh meat. Started December, 2003 Enforcement of the meat, ham, sausage product traceability
- Systemized the traceability by using ASP.



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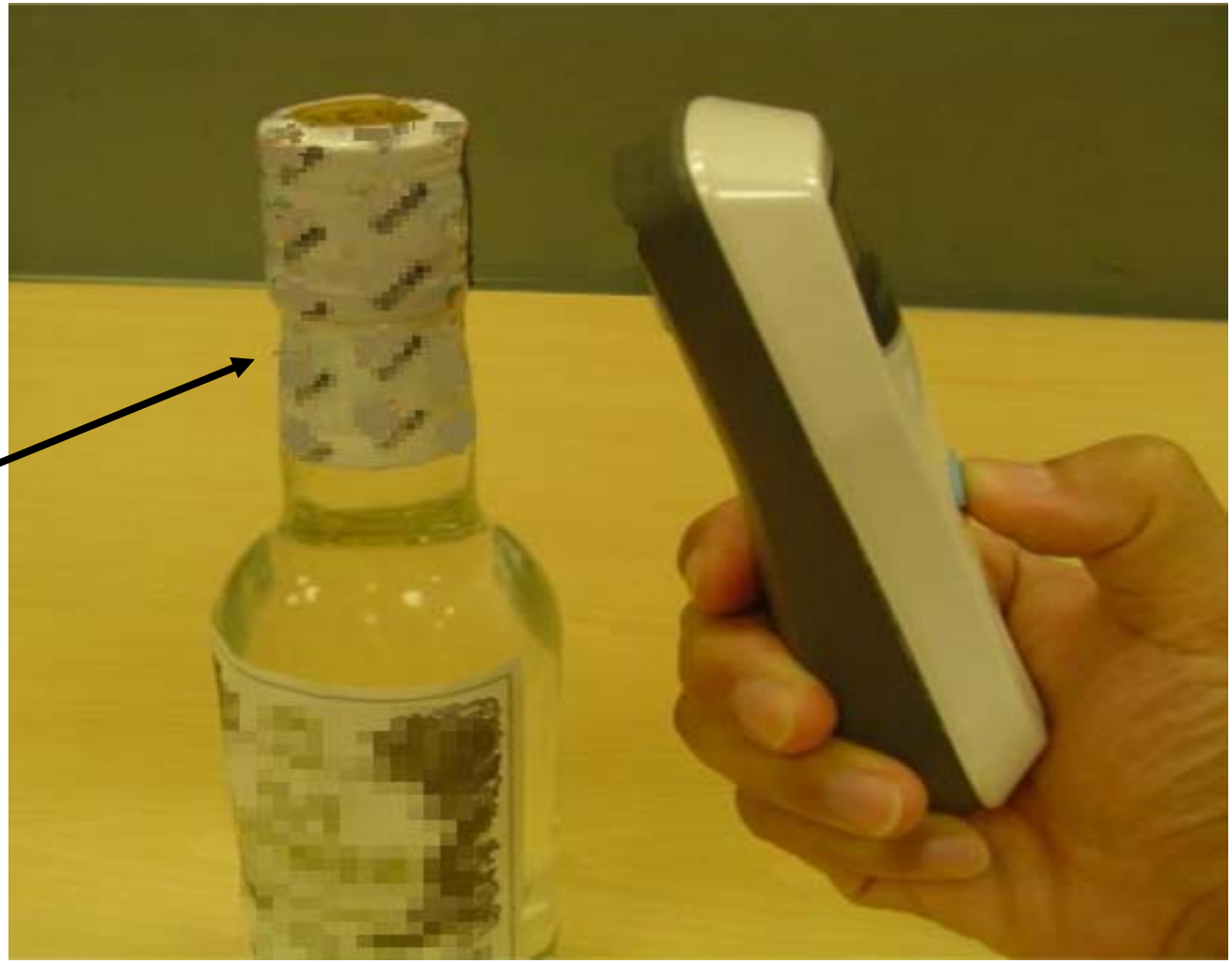
3-6 Example 3: Anti-counterfeit protection for Liquor



Liquor label with fragile antenna µ-Chip inlet (prevent reuse)

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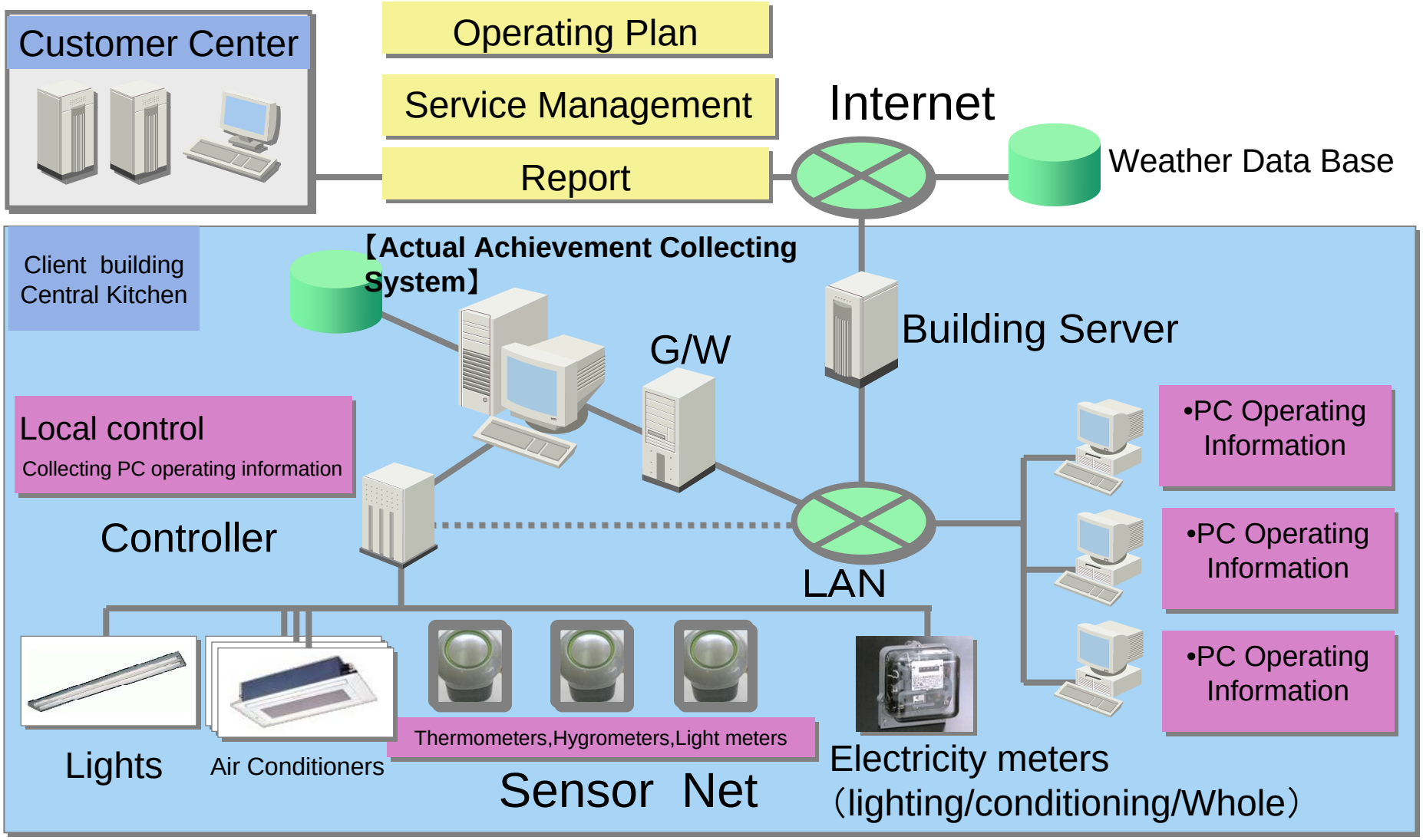
4-1 New Environmental Health Management and Energy Conservation using Sensor Net



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4-2 Joint activities for Traceability Implementation

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

Ministry	Ministry of Economy, Trade and Industry	Ministry of Internal Affairs and Communications	Ministry of Agriculture, Forestry and Fisheries	Ministry of Land Infrastructure and Transport	Ministry of Health Labor and Welfare	.....
Industry	Steel	Publishing	Apparel	Food	Medical Drug / Health	.....
Platform	Ubiquitous ＩＤ Center	RFID tag & reader supplier				.....

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4-3 Summary of Why RFID can be implemented

- Address compliance issues
  - Food safety directives

- Improve Operational Process
  - Create “joined up” databases with ease of access for multiple types of user and organisation
  - Trace forward and trace back functions at each stage in supply chain
  - Allow consumers to validate what they are buying
  - Provide increased information levels to enhance consumer experience – which wine goes with which meat !

- Provide increased levels of accountability
  - Is it a genuine article ?
  - When and where was it processed or grown ?
  - Has it been produced by a certified provider ?
  - Have all of the relevant processes been followed ?

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4-4 Summary

World-wide concerns over **Food Safety**

→ Food Traceability as a high priority issue

Strong requirement of **item level tracking** for individual product management

Application of small 13.56MHz/2.45GHz **RFID tags** suitable in various food products to ramp-up **food safety systems**

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