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- Session 6-

# Future trends in Japanese RFID Technologies and Market


Noboru Koshizuka, Ph. D

Vice Director, Ubiquitous ID Center

http://www.uidcenter.org/

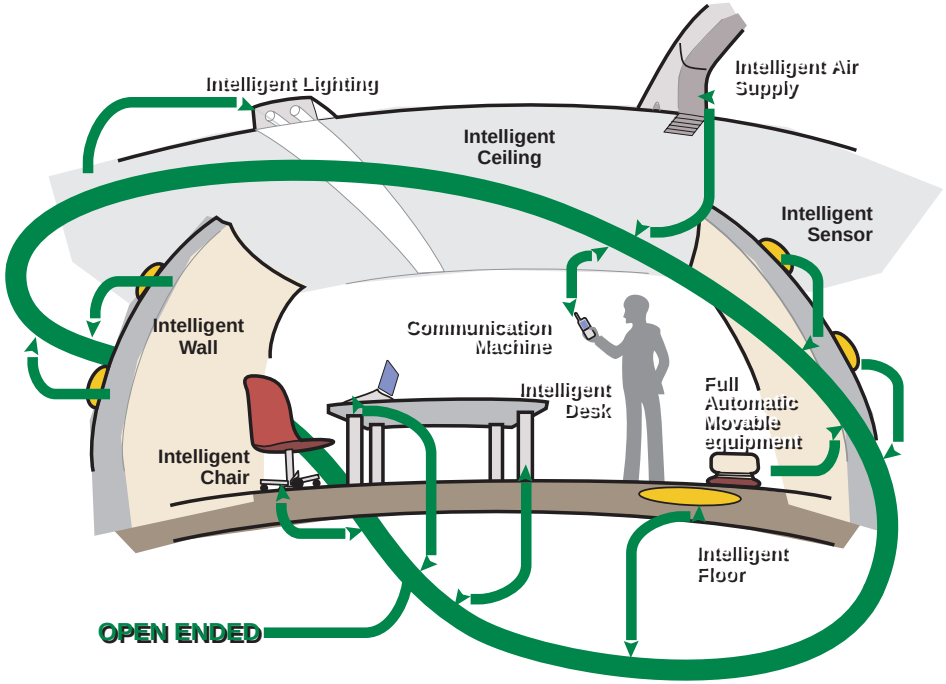
(The University of Tokyo, YRP Ubiquitous Networking Laboratory)



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

# Ultimate goal of NRFID

- The ultimate goal of the NRFID or ubiquitous computing technology is to increase the variability to social infrastructure, the organized environment control, and the organized optimization.



# Difference between NRFID and Conventional RFID

- The consistent technology are required at the communication protocol, the data exchange form, and the identifier etc for the information and telecommunications networks as well as the NRFID.
- The function of NRFID can be complemented by communication service because it can work in cooperation with communication service.
- The threat of security is high because NRFID is connected to remote and open network.

# Difference of Applications

- Conventionally, RFIDs have been used for only B2B services such as
  - supply chain management, and
  - automation of shipping process.
- Hereafter, NRFIDs should be used for customers' applications, and increasing the quality of our daily life such as
  - ubiquitous information services for food safety,
  - drug information services for our health, and
  - location-aware information services for way-finding or sight seeing.

# Differences between Conventional RFID and Networked RFID

| | Conventional RFID (eg. ISO, EPC) | NRFID (ITU-T, uID Center) |
|---|---|---|
| Typical Applications | B2B Applications (eg.) SCM, | Consumer Applications, B2C-C2C Applications (eg.) Food Traceability, Location-aware Services, Drug Information Services, … |
| RFID Tag code | Product codes | Identification numbers |
| Product Information | Encoded in product code | Stored in information servers over the computer networks or telecommunication networks |
| Tags | Passive RFIDs | Minimum passive RFIDs, Active RFIDs, |
| Backend Network | None or closed network | Open and public network |
| Security | None | Strongly required |

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# New trends of RFID technology

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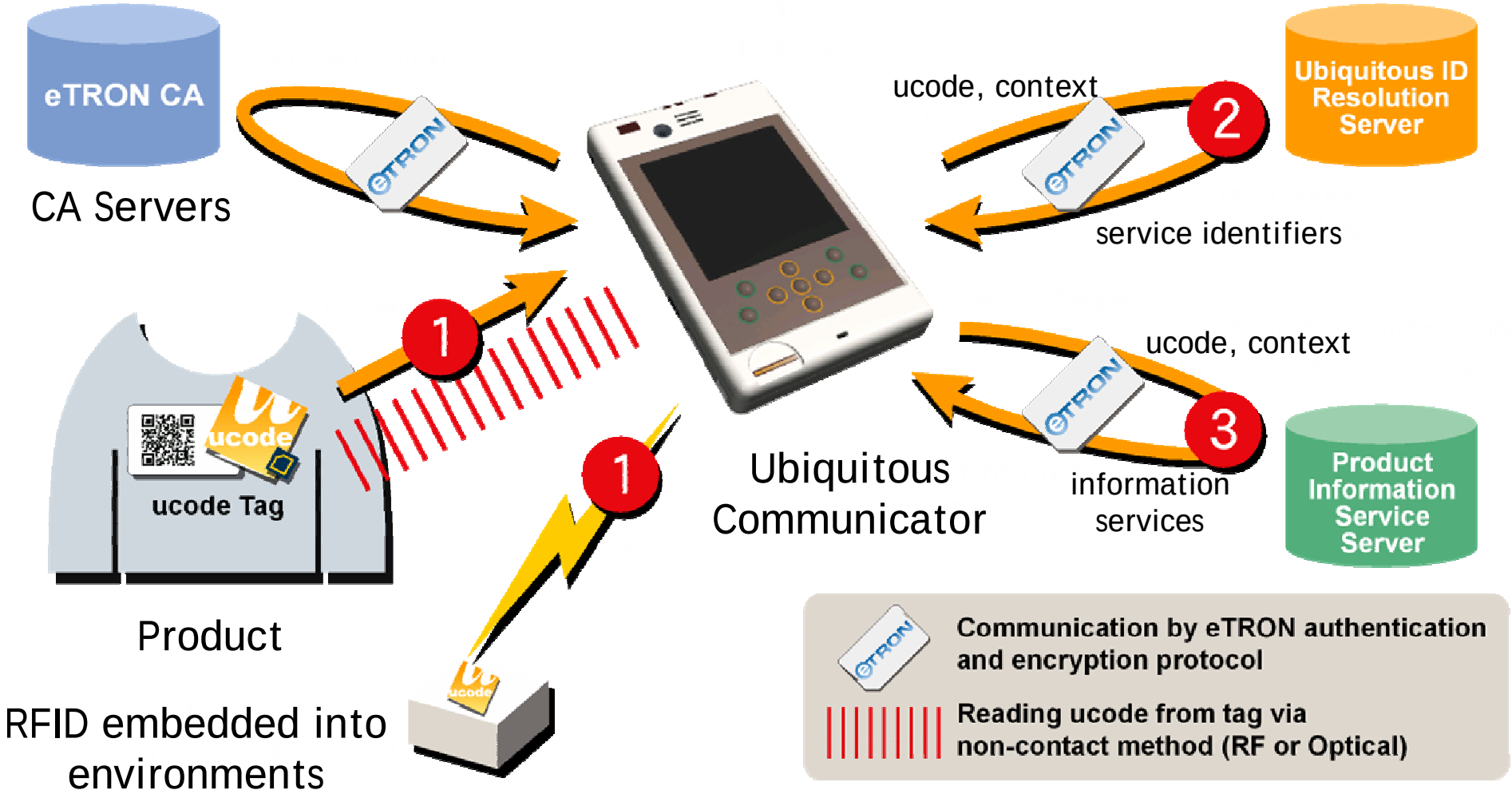
# Networked RFID Architecture



# New trends of RFID technology

- Functions of RFIDs are complemented by ubiquitous networks.
- "Tag-minimum" concept
  - i.e. A tag contains only identifier.
- Integration of various tags: barcode tag, RQ code tag, color code tag, passive RFID tag, smart card tag, active tag, sensor network tag, …
- Using portable human interface devices: Mobile phone or PDA
- Deployment of general purpose tags in our society
  - eps. RFIDs and IR/RF beacons as location identifiers
    - it is like a new social infrastructure

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# New Applications and Services of Network RFIDs

ITU-T Workshop "Networked RFID: Systems and Services"
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# New Applications and Services

1. Food information tracking services
2. Information services for drug safety
3. Location-aware information services

# Food information tracking services

# Food Information Tracking for Food Safety

# Food information tracking services (1)

- "Food communication" services
  - We bring the information of food production and food distribution to consumers. The consumer refers the information, and confirms the safety of the food by themselves.
- For example, …
  - We have applied the RFID for the distribution of fresh vegetables and fruits (about 200 items).
  - We also put the active sensor tags with temperature sensor into the container box and pallets.

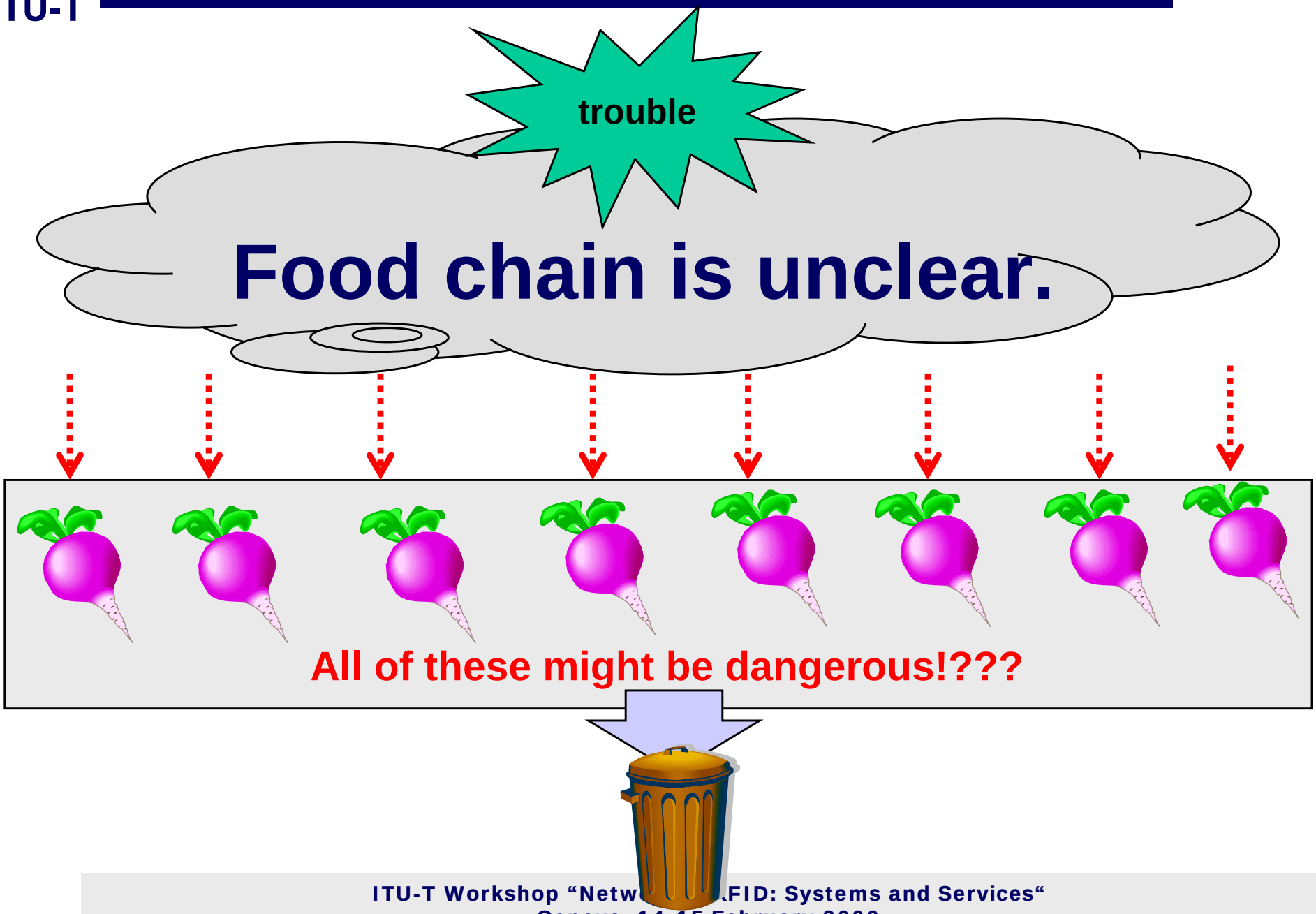
  ↓

  - The consumers can confirm every information about the food.

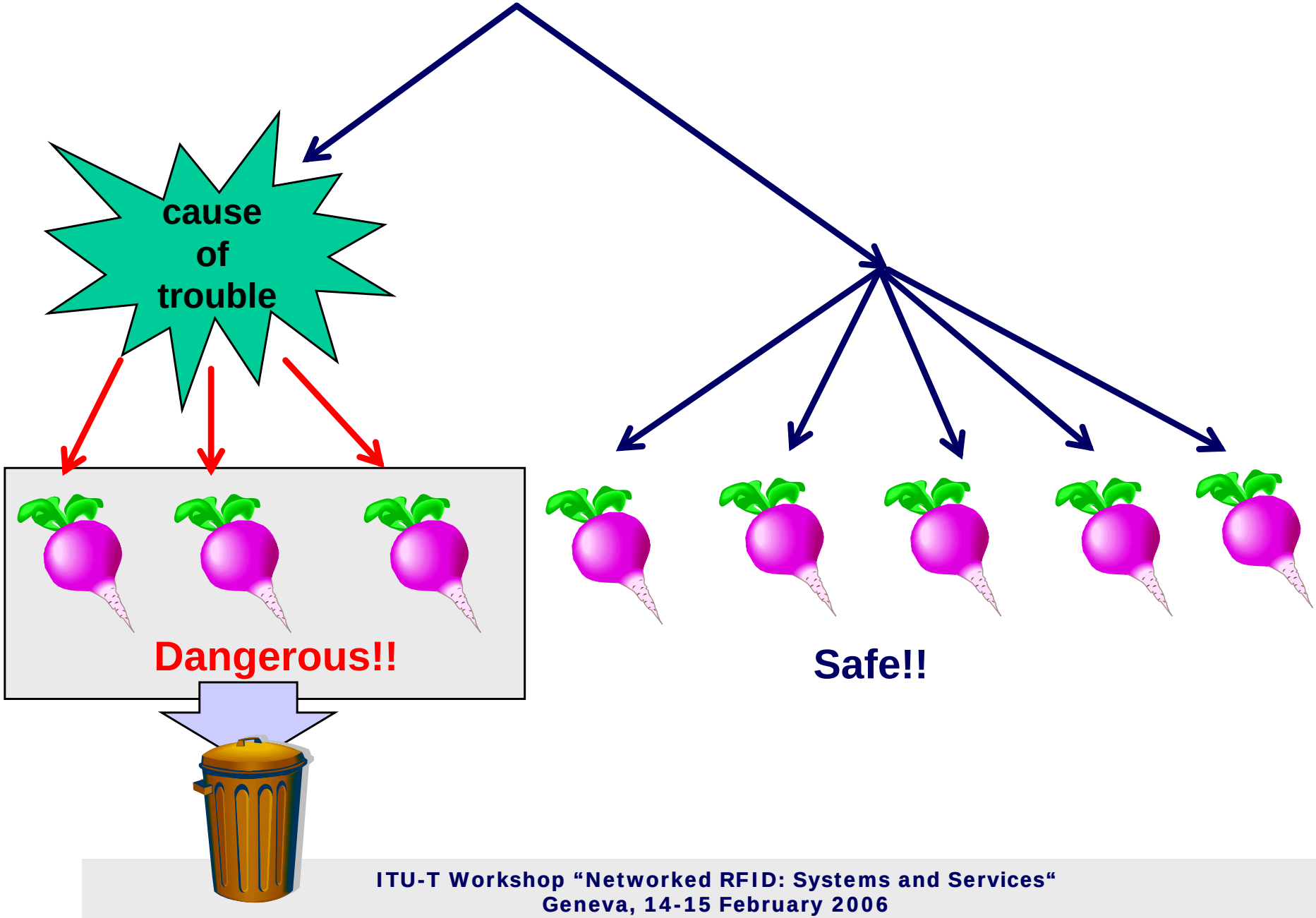
# Food information tracking services (2)

- Quality management system
  - When food accidents occurs, we can minimize the amount of trashed foods by the strictly food safety checking.

# “Before” food information tracking

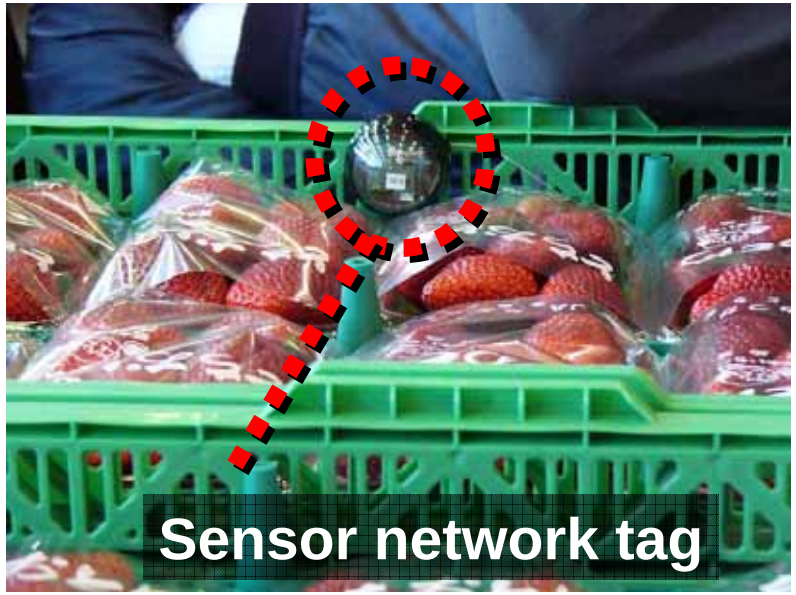


# "After" food information tracking



# Information collection at farms

# Measuring temperature of food



# Showing food information to consumers (1)

# Showing food information to consumers (2)

Kiosk Terminal

Mobile Terminal

# Result of experimental project

- Most Japanese consumers expressed their good impression for this information services.
  - Recently, Japanese consumers are very nervous for the quality and safety of food.
- Half of Japanese consumers will buy even expensive foods if their quality is certified.
  - They will pay more 10% cost for food safety.

↓

- There is a potential market for food safety information in Japan.

# Information services for drug safety

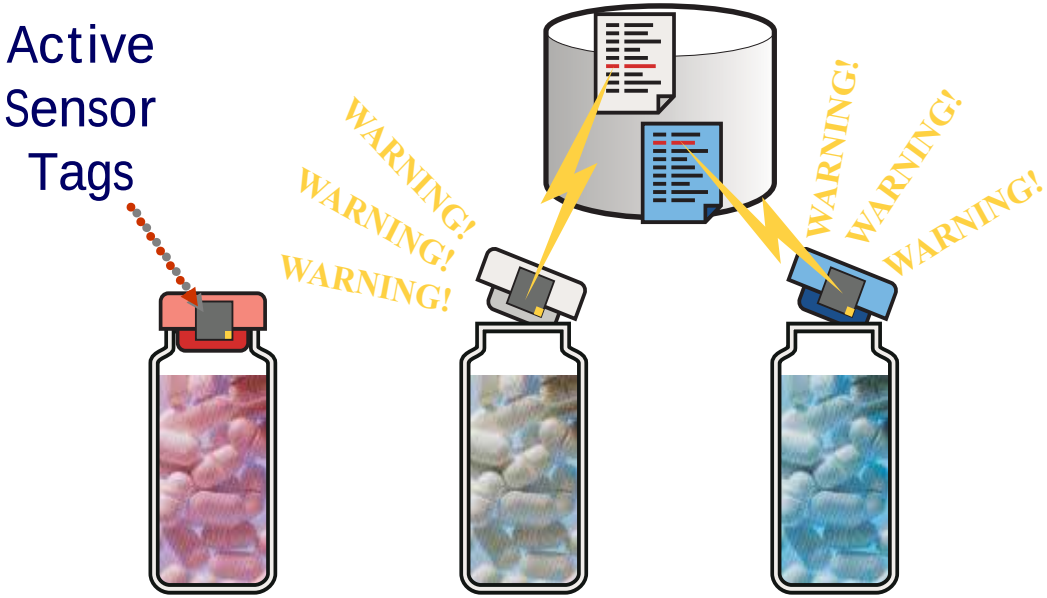
# Medical Applications

- NRFID technology is effective to prevent accidents or mistakes in hospitals.
- For example,
  - We put NRFIDs on drug packages.
  - NRFIDs notify doctors or nurses which kinds of drugs are conveyed in the patient room.
  - If the drug is not correct, the base station makes warning for the doctor or nurse automatically.

# Improving safety in hospitals

# Much more innovative trial

Medical records and prescriptions of patients



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# Location-aware information services

# Location-aware Information Services

- We are embedding huge number of active tags, sensor networks, and RFIDs all over the Japan land.
- They support human navigation especially for handicapped people and foreign people.
- They are also used for supporting sight-seeing, shopping, supply chain management, and so on.

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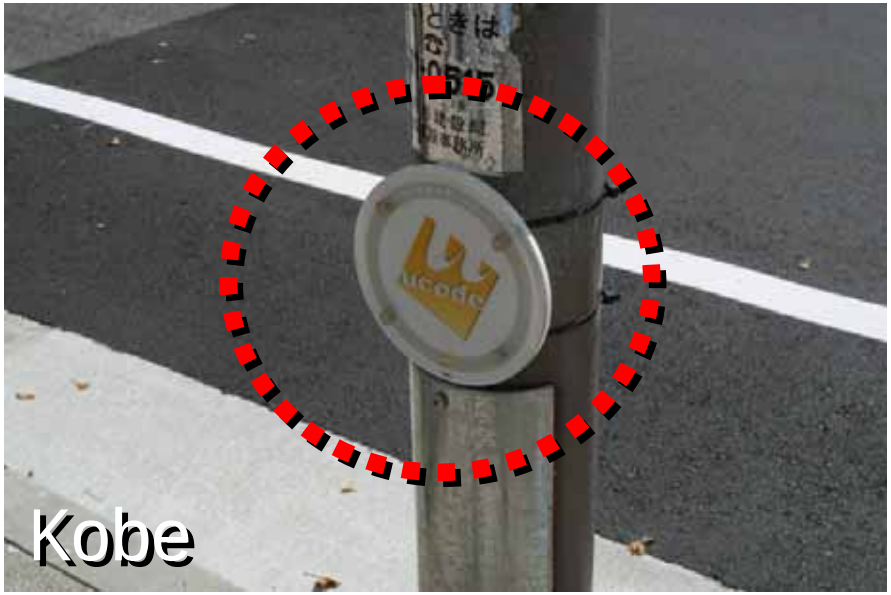
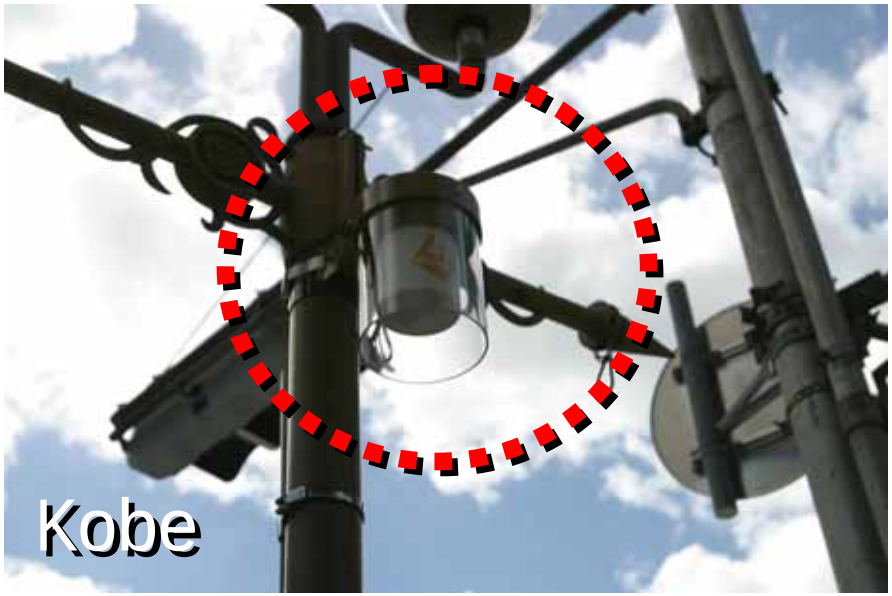
- It's a kind of ITS: Intelligent Transport System for HUMAN.

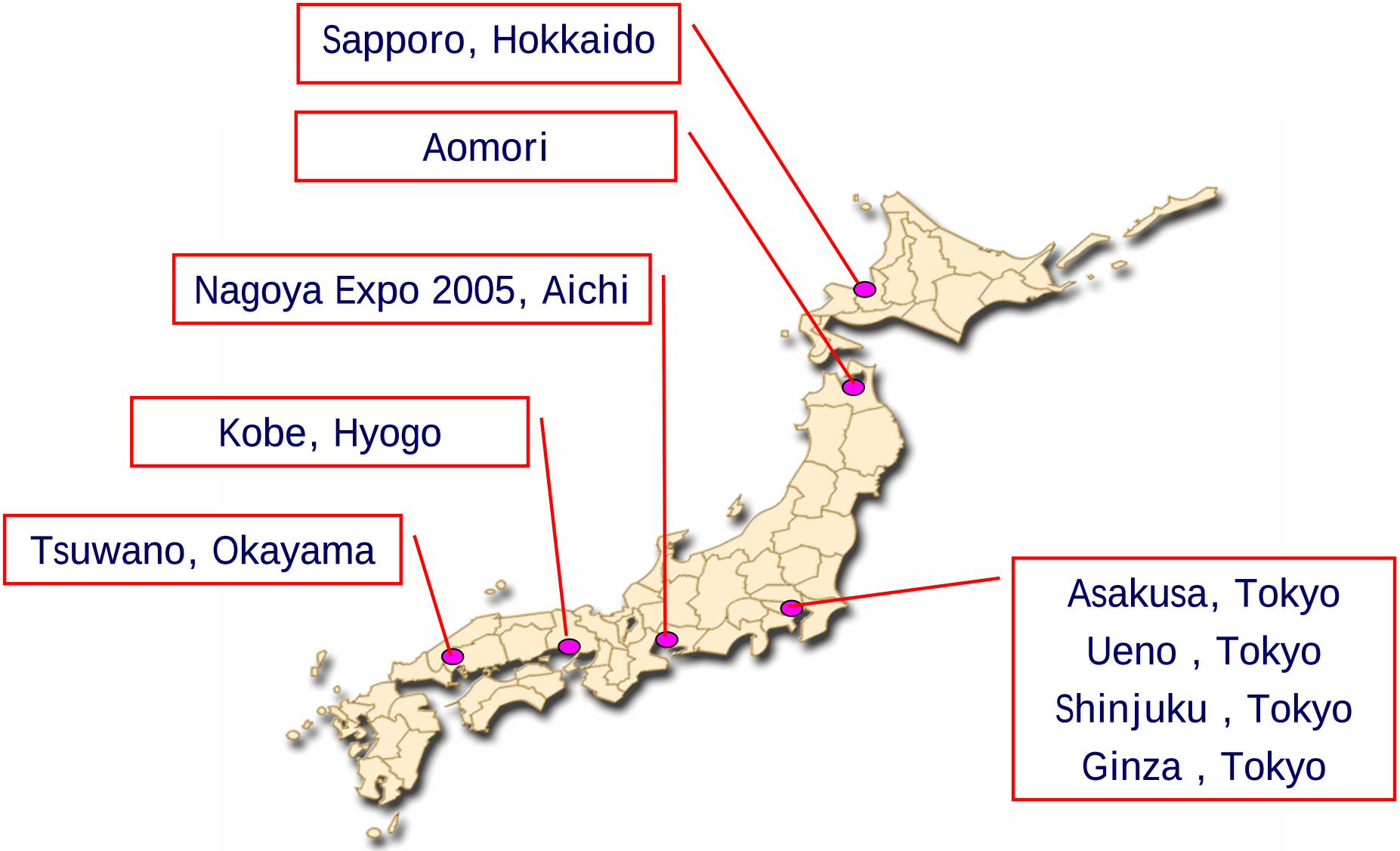
# Location-aware information services (Infrastructure)



# Location-aware information services (Services)

# Deployment of location-aware information service infrastructure



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# Standardization and Social Infrastructure

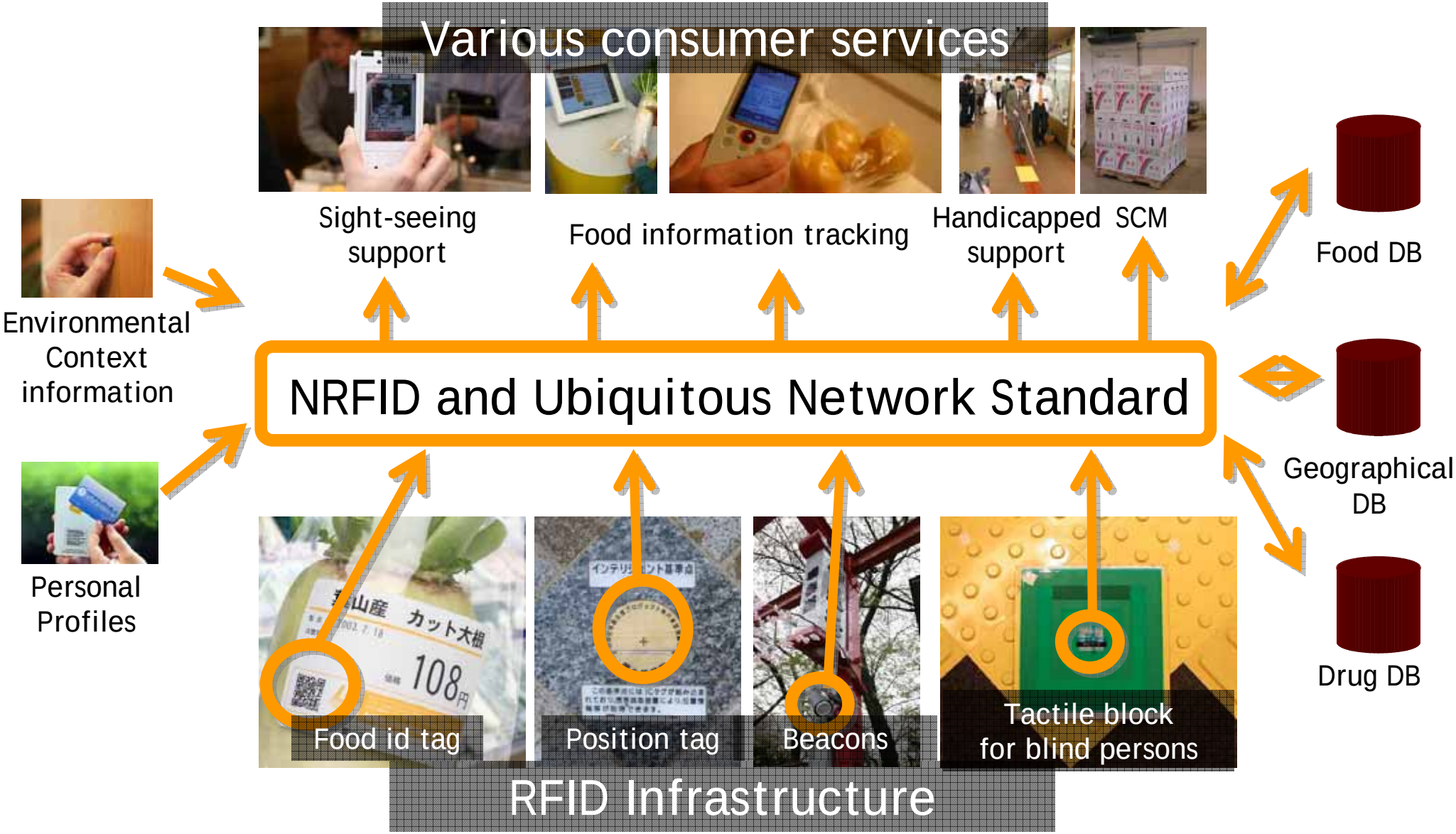
# Features of NRFID Information Services

- Ubiquitous information services are effective for any kinds of business sectors.
- Application covers ot only B2B services, but also B2C and/or C2C services
  - "Consumer" is just the key
- Increasing security and safety of citizens
  - Some services are "life-critical"

# New "consumer" services make a new market

- B2B services do not make a new market because they are effective only for cutting cost.
  - e.g.
    - Supply chain management
- New consumer services make a new market because they directly generates new values.
  - e.g.
    - food safety information market
    - drug safety information market
    - tourist information service market

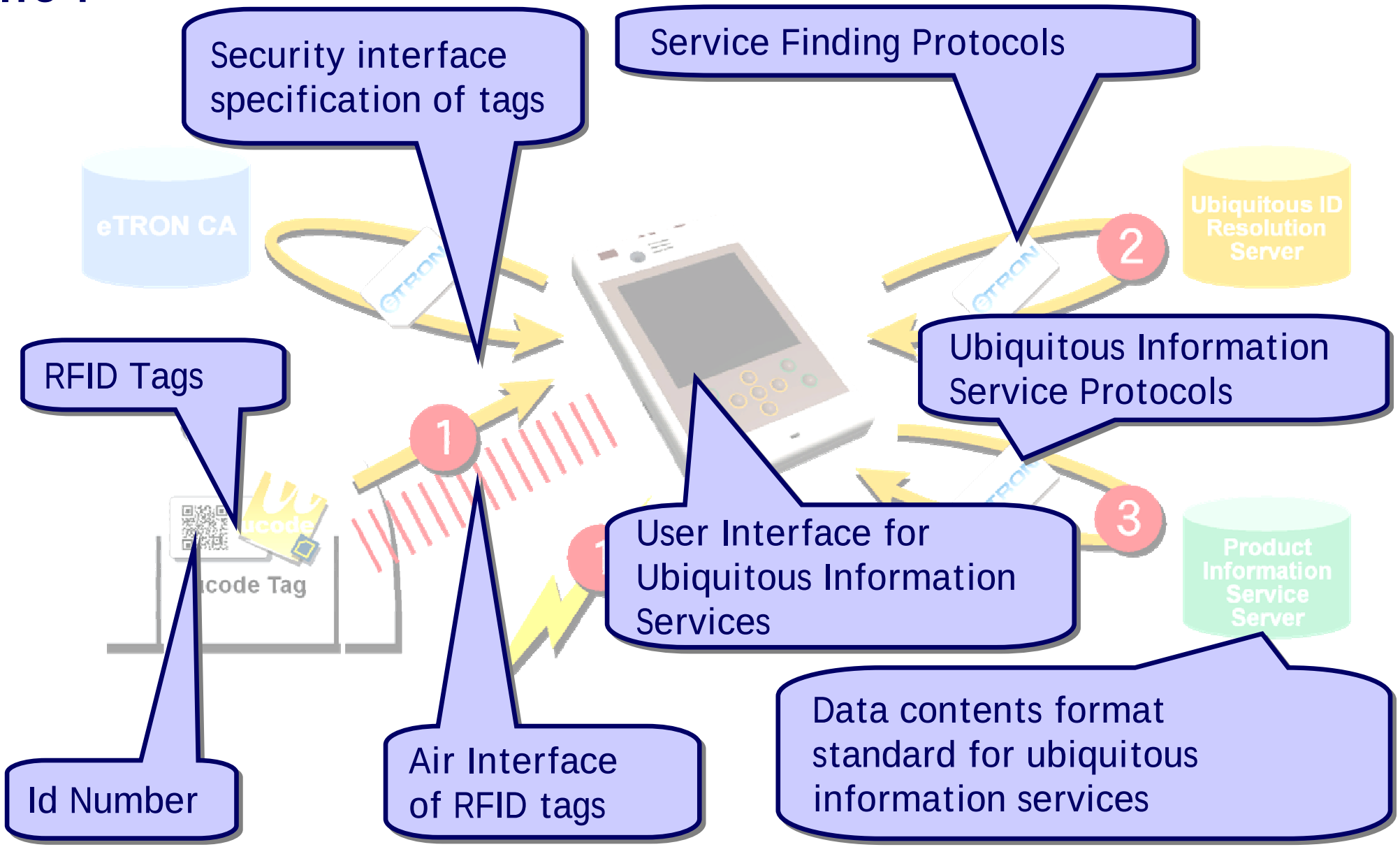
# "Consumer" require international standardization



# Conclusion

## -Suggestions for ITU NRFID standardization activity-

# NRFID Standardization Areas in ITU



# Standardization Areas for ITU

- To realize the various applications and information services, a lot of standardizations are necessary as follows:
  1. Identification number for objects and places stored in NRFIDs
  2. Service finding protocols for ubiquitous information services using RFID identification numbers
  3. Ubiquitous information service protocols
  4. Data exchange format for ubiquitous information services using NRFIDs
  5. NRFID tags (including contactless communication protocols)

  more …

# 1. Id number for objects and places

- It is the identification number that identifies the most important individual thing and place in the real world in recognizing the real world.
- This is used not only as the number allocated to the RFID tags but also as the key to retrieve the network information service.
- This only aims at conducting the individual identification.
  - In allocation of id, the content of the number is meaningless.
  - This id is also different from the commodity code which encoded the attribute of things.

# 2. Service finding protocols

- This is the communication protocol for the resolution of identification code for ubiquitous information services.
- It is a kind of directory service system to retrieve the information such as the network address of information service from the identification code.

# 3. Ubiquitous information service protocols

- It is the communication protocol that provides the information service arisen in the wake of the NRFID.
- This standardization enables browsing the information services, which is led by the RFID patched to various things mixed in our daily living environment, with identical terminal and browser software.

# 4. Data exchange format for ubiquitous information services

- This is equivalent to the presentation layer in the information service protocols.
- This standardization enables browsing the information services, which is led by the RFID attached to various things and places mixed in life space, with identical terminal and browser software.

# 5. NRFID Tags Standards

- There are un-standardized classes of RFIDs.
  - RFIDs mainly for network use.
  - Secure RFIDs.

| | Passive RFID | | Active RFID | USN (Ubiquitous Sensor Network) |
|---|---|---|---|---|
| | Read Only Type | Rewritable Type | | |
| | **Identification Number Specification (ITU)** | | | |
| Data Format | **ITU**<br>**! This type is useful only if network services are available.** | ISO/IEC 15961, 15962, 15963 | **ITU**<br>**! This area is just the area of computer networks.** | |
| Application Layer | | | | |
| L1～L4 | | ISO/IEC 18000<br>ISO/IEC 15693<br>ISO/IEC 14443 | ISO/IEC 18000 | IEEE 802.11.* |

# For More Information...

*Ubiquitous ID Center*

http://www.uidcenter.org/

uid-office@uidcenter.org

koshizuka@ubin.jp