

Hitachi's New Wireless Technologies and Business Opportunities



December 1st, 2005

Jack Motoyama, Corporate Venture Catalyst Division
Hitachi America, Ltd.



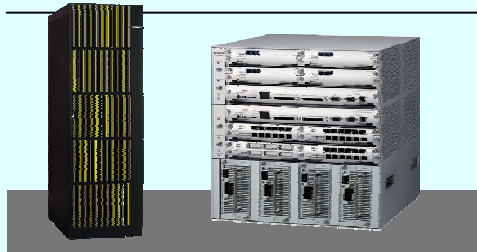
Agenda

1. Hitachi's Overview
2. New Business Development Program
3. Mu-Chip Solution Business
4. Wireless Info Business

Hitachi : Infrastructure Company

(Revenues in US\$ billion)

Information & Telecommunication Systems



US\$21.8b

Electronic Devices



US\$ 12.4b

Financial Services

US\$ 5.2b

Logistics, Services & Others

US\$ 11.9b

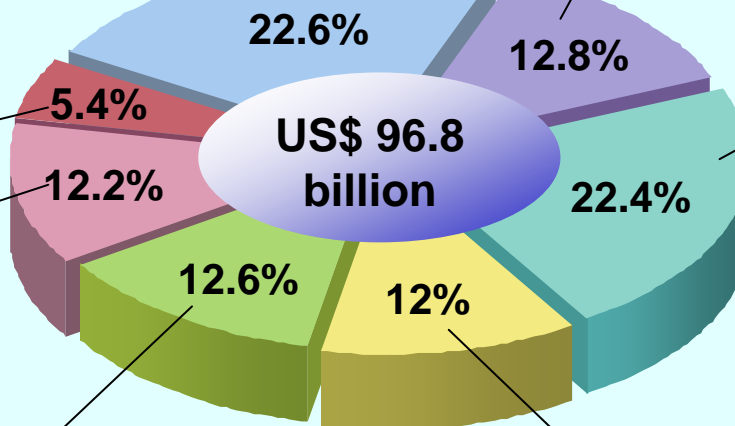


High Functional Materials

US\$ 12.2b



US\$ 96.8 billion



Power & Industrial Systems

US\$ 21.7b



Digital Media & Consumer Products

US\$ 11.6b



All figures are included Eliminations and Corporate items, FY2003/Consolidated basis
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Hitachi's Corporate Culture

Founder :Namihei Odaira

Harmony

和

(“wa”)

Sincerity

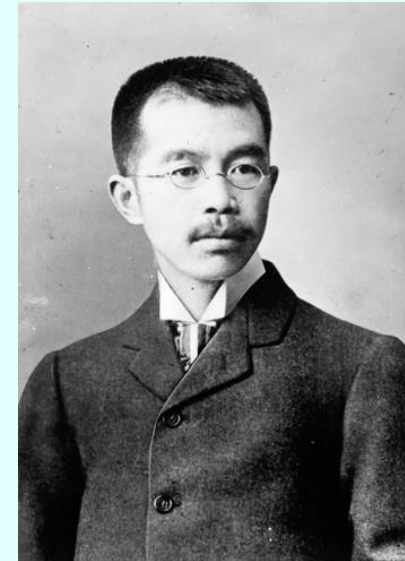
誠

(“makoto”)

**Pioneering
Spirit**

開拓者精神

(“kaitakusha-seishin”)



Birthplace of Hitachi





New Business Development Program

1955 - Spin-out of non-core business (spin-out – IPO)

Hitachi Metals (1956-1961), Hitachi Cable (1956-1962),
Hitachi Chemical (1962-1970), Hitachi Construction Machinery (1965-1989),
Hitachi Software Engineering (1970-1990)

1981 – Strategic Product Strategy Committee

Strategic Product Planning – Semiconductor Equipment, etc.

1995 – Corporate New Business Promotion Center

Multimedia Systems, System LSI, etc.

2000 - Corporate Venture Capital Fund

Strategic Venture Investment and Partnership

2001- Corporate Senior Staff Under President

Creating New Business and Service Business



Hitachi's Corporate Ventures and Academic Development

Missions of Hitachi Corporate Ventures

Innovation and Growth through Partnership with Venture Companies

Objectives

- Increase business opportunities through strategic investment
= **Ventures' technology and business process**
+ **Hitachi's technology, sales channels and resources**
- Complementary to Hitachi in-house R&D activities
- Promote Entrepreneur Spirits at R&D and Business Group

CVC Fund

Established in July 1, 2000 with \$100m of Capital

Academic Network

- Universities (Stanford, UCB, MIT, Caltech, Cornell)
- Government-sponsored incubation programs



Hitachi's Venture Company

1) MU-chip Solution Venture Company (July 2001)

Tiny RFID tag solution – 128 bit ROM

2) Personal Healthcare Venture Company (Sep 2002)

Non-invasive measurements of glucose

- Metabolic Heat Conformation (MHC)

3) Wireless Info Venture Company (Jan 2004)





MU-chip Solution Venture Company - Dr. Ryo Imura

Chief Executive Managing Director of Mu-Solutions Division, Information & Telecommunication Group, Hitachi, Ltd.



Research --- Information Data Storage for Magnetic bubble memories, Optical data storage and Magnetic recording

He became a President & CEO of Mu-solutions in-house venture company in Hitachi Ltd. established on July 1st, 2001



A little pig goes a long way before,,,,,



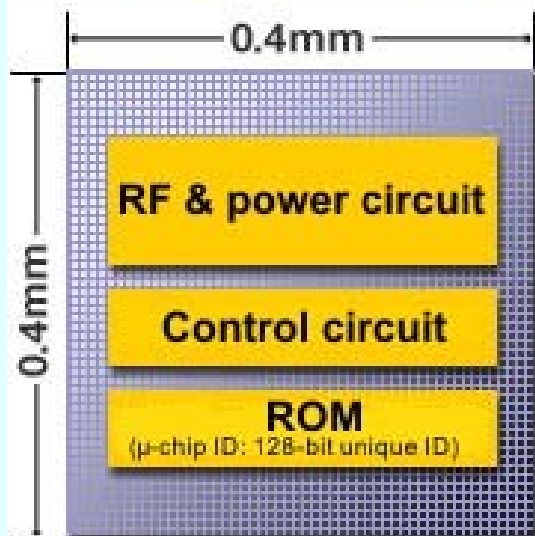
**RFID Tag on
“Babe”**

What is “ μ -Chip” ?

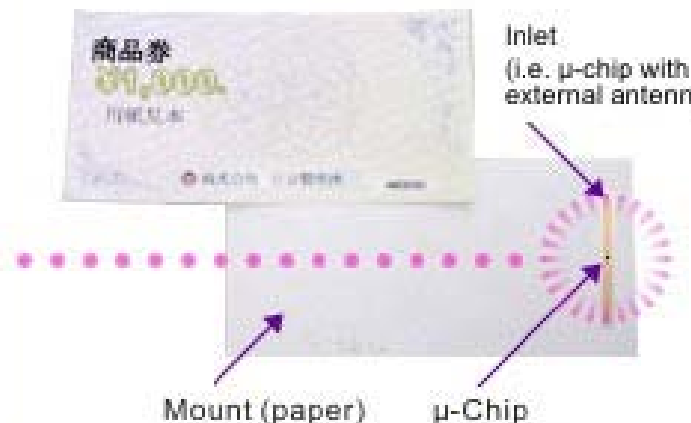
Mr. Mitsuo Usami, Hitachi's Central Research Laboratory,
Developed Mu-chip with Processing Data on the Network.

Dr. Ryo Imura Became President & CEO of Mu-solutions In-house
Venture Company on July 1st, 2001 to Commercialize and
Promote the Mu-chip RFID System Solution Business.

A block diagram of the μ -chip



Radio frequency: 2.45GHz



Latest μ -Chip (enhanced version)

μ -chip -The World's Smallest RFID chip-

- Basic Features : Read only memory, battery less
(Chip Size : 0.4mm x 0.4mm, **0.12 \rightarrow 0.05mm thickness**)
- Data Capacity : 128-bits unique ID number (written in production)
(Low Cost : Network based information data management)
- Maximum Communication Distance : **30 \rightarrow 100cm**
- Anti-collision version : **\rightarrow 100 IDs/sec** (max)

External antenna

μ -chip(0.4 \times 0.4mm)

μ -chip is packaged here

Inlet (μ -chip with external antenna)

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Why is RFID heating up now ?

Social Demand

- Security /Safety
- Reliability /Quality Control
- Lifecycle /Traceability

User Needs

- Minimize Opportunity Loss
- Efficiency Improvement
- More Cost Reduction

Auto Identification & Authentication in Ubiquitous Network

RFID Technology

- Identify huge number of items
- Acceptable performance

Miniaturization

Cost reduction

Stable volume supply

High Expectation for RFID Technology

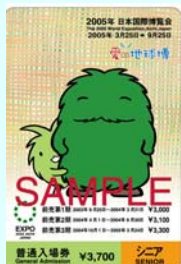
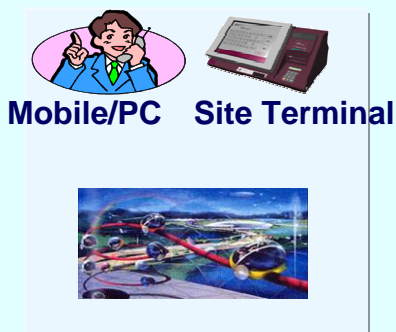
Ticketing Solution for World EXPO 2005

(Mar25-Sep25, 2005 @Aichi)

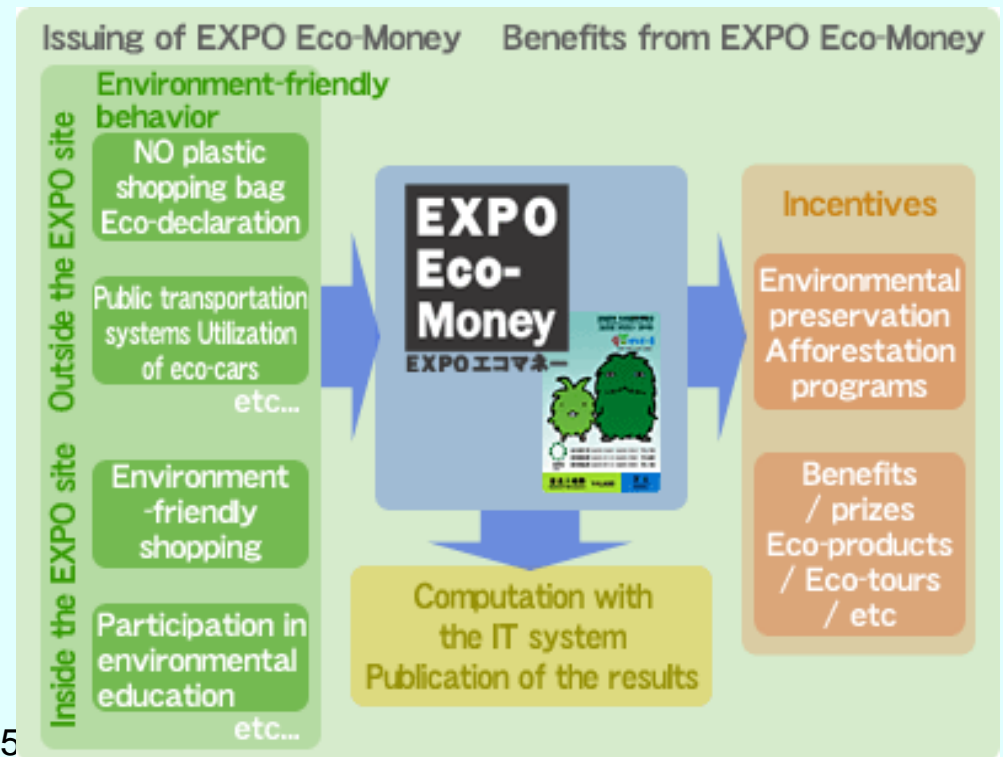
- Preliminary Reservation through μ -ID
- Smooth Entry and Exit at the Site
- Personal Attendance Service
- Real time Ticket counting / Tracing
- Preventing Ticket counterfeit

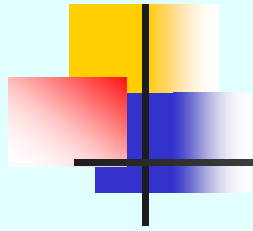
total 25M tickets

Preliminary Reservation Smooth in/out
-Pavilion, Events.... Gate by μ -ID



(c) 2005





Three Categories of RFID application)

Auto Identification, Authentication, Traceability of Things



Safety and Security

Shadow cost



Quality Control
Traceability
Reliable Handling

Must to have RFID

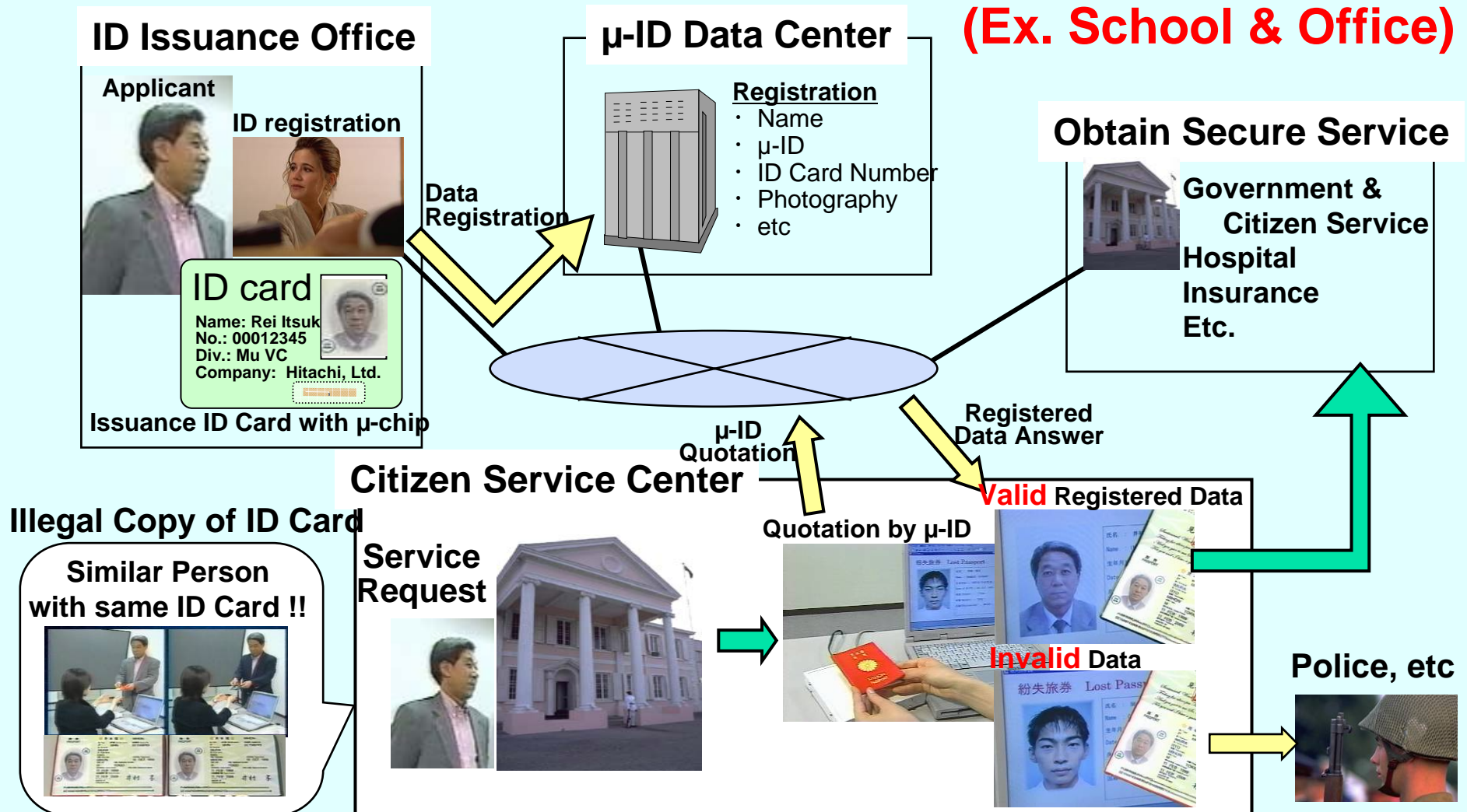


Marketing
Brand Protection
Cost reduction in SCM

Nice to have RFID

Secure ID Management Solution

◆ ID card with embedded μ -chip for Secure Authentication (Ex. School & Office)



Example of Individual item Tagging

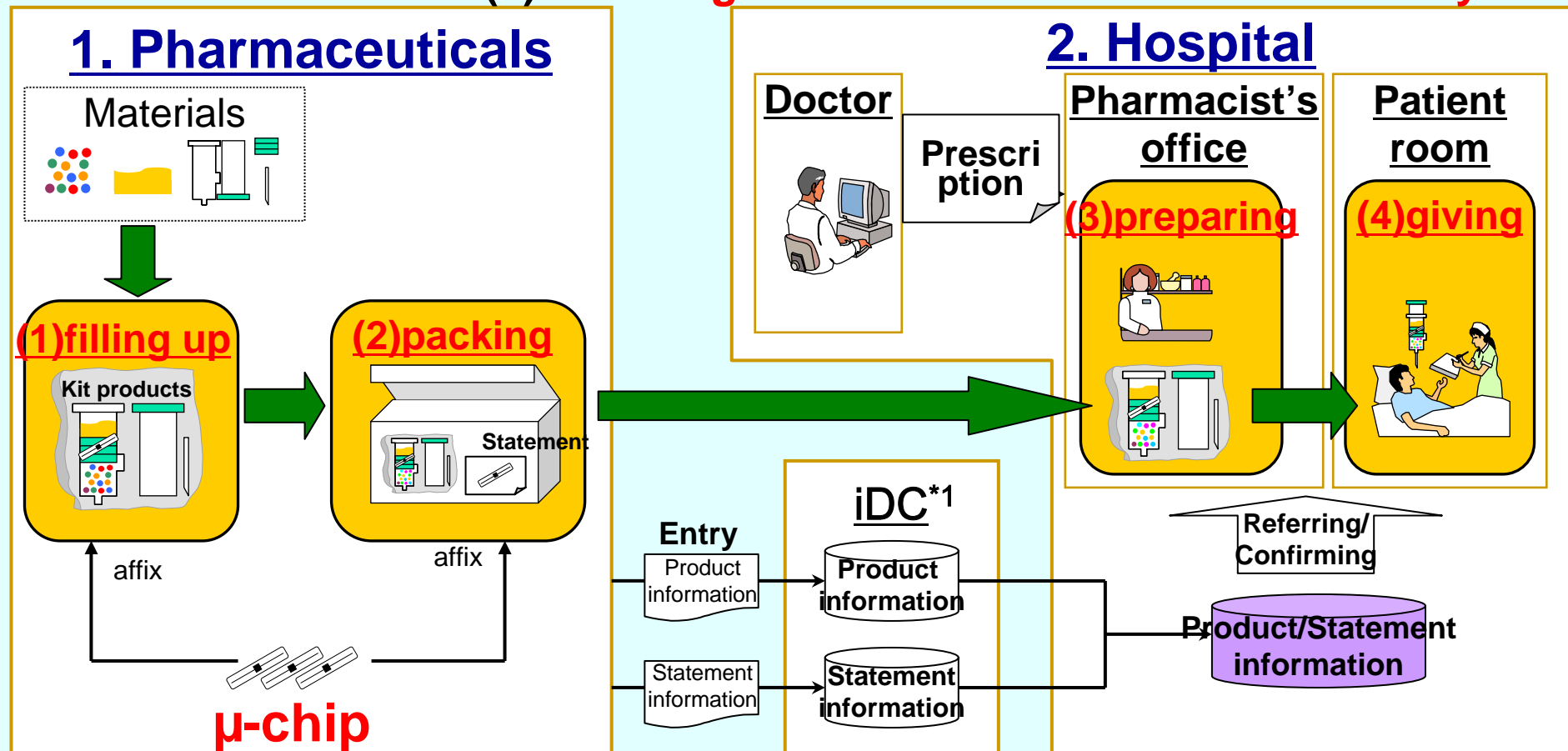


Newly developed **small size antenna**
(3mm x 4mm) for Item level tagging

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Medical Solution (Preventing Human Error)

1. Pharmaceuticals :
 - (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



Animal tag for Individual Pig Trace



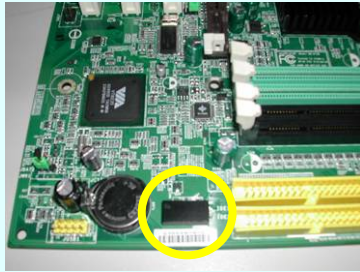
*What Brand
Which Farm
How to breed
When to be inspected*

Anti-counterfeit Prevention for Liquor

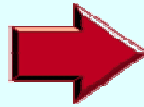


*Liquor label
with fragile
antenna inlet
(not to reuse)*

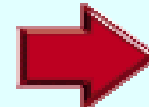
Production & Quality Control Solution



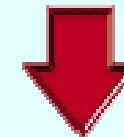
Put customized μ -chip tag on the PCB



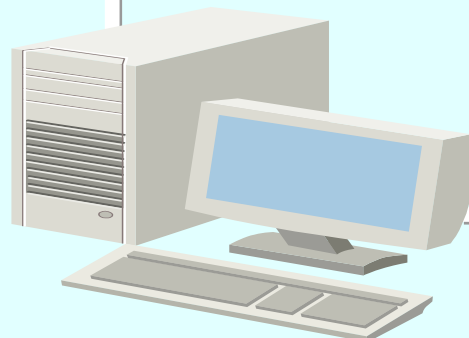
Quality control and tracking by reading μ -chip tags



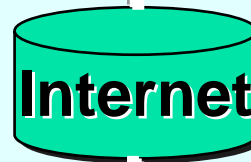
Distributors/retailer can verify the product and get product information by reading μ -chip tag.



Service engineers can verify the product and get information by reading μ -chip.



Data control center



feedback

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The Tech Museum of Innovation @San Jose

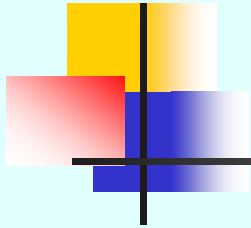
Interactive experience enabled by RFID wristband

A website interface for entering a TechTag number. The header is orange with "TheTech Museum of Innovation" logo and "my.thetech.org" text. Below is a blue area with a red circular icon of a hand holding a wristband. The text "Enter your TechTag number here:" is in red. There is a white input field and a grey "GO!" button.

Visitor can re-experience interaction at museum Website

Conversion to μ -chip greatly reduced cost of RFID wristband program





Three Categories of RFID application)

Auto Identification, Authentication, Traceability of Things



Safety and Security



Quality Control



Shadow cost

Traceability

Reliable Handling

Marketing

Must to have RFID

Brand Protection

Cost reduction in SCM

Nice to have RFID

Office,
Convention,
Hospital,
Pharma

Agriculture,
Food,
Apparel,

Retail,
Product Lifecycle

Huge Potential in Every Industry!

μ-Chip Solution – Business Model

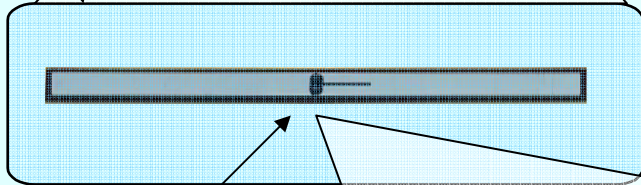
Reading distance
up to about 30-100cm

2.45GHz

Link μ-Chip ID with Application data

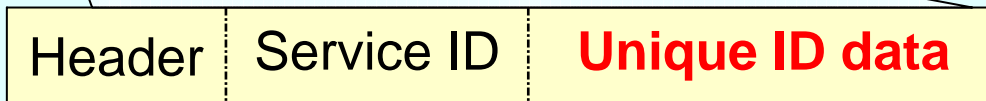
Reply μ-Chip ID

Tag (example)



μ-Chip

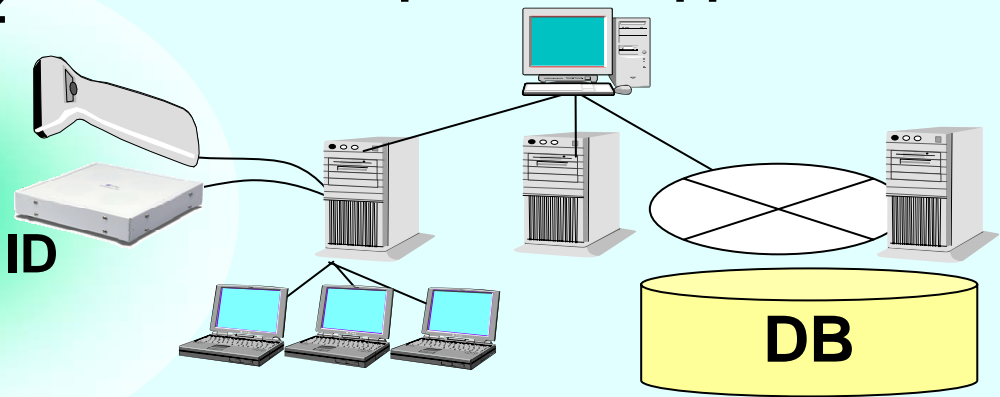
μ-Chip ID



ID can only be written
at chip manufacturing
process

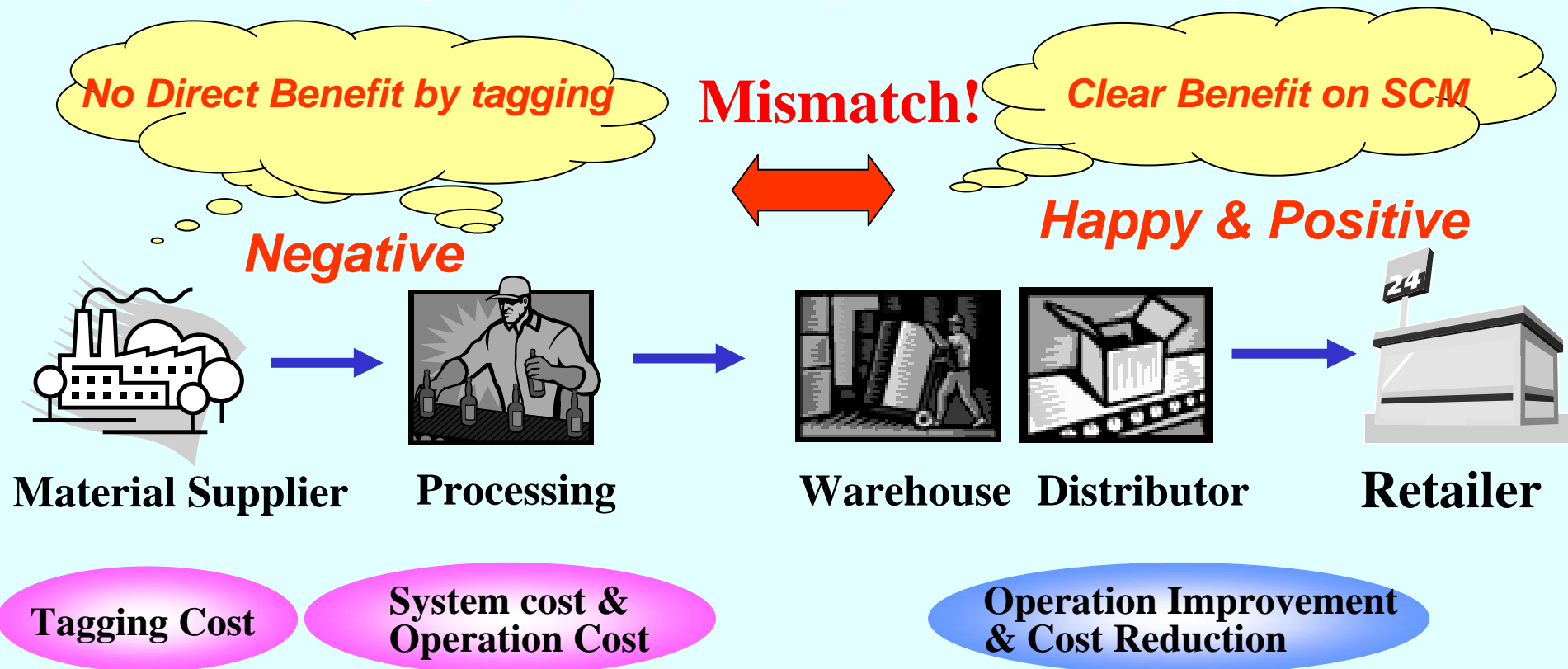
128 bits = 10^{38}

Chip, Tag, Attachment and Readers
Unique ID number issuing
Middleware platform and APP
System Integration
Engineering and Consultation



SCM for "Open" Industry User

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



"Beneficiary" ≠ "Cost Payer"

Who is the "Decision Maker"?

Mechanism for cost-sharing and balance the costs and benefits

Ubiquitous use of Networked RFID

Secure & Easy access from anywhere and anytime





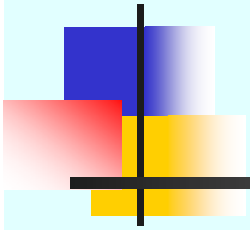
μ-Chip – Opportunities / Challenges

1. From industry user's point of view
High Performance & Clear Benefit
(Simple framework for 'In-house' user)

**How can RFID solutions meet the
Customer's requirement**

2. From end-user's point of view
Respecting to the customer's **Expectation**
Resolve the existing **customers Pain**
- **Security & Safety**
- **Reliability & Quality Control**
Pay attention to **Privacy Issue**

Wireless LAN Positioning System “AirLocation”





Wireless Info Venture Company - Dr. Taizo Kinoshita

CEO of Wireless Info Venture Company,
Hitachi, Ltd.

He joined the Central Research Laboratory,
Hitachi, Ltd. in 1981

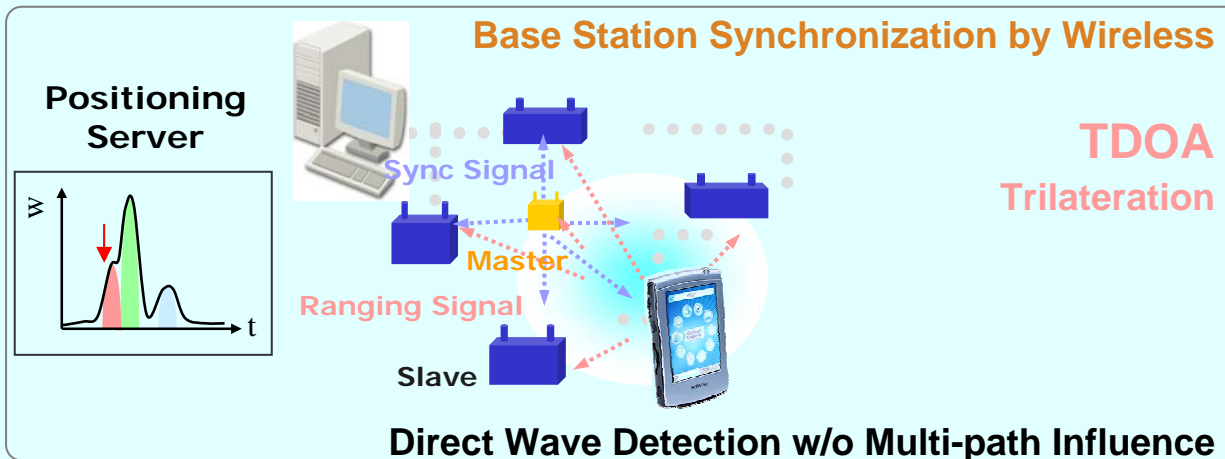


Research --- High-speed optical transmission systems and
HDTV digital transmission systems for B-ISDN.

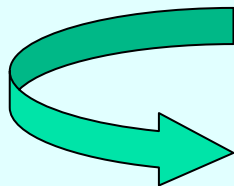
He became Corporate Senior Staff under President in 2003
and develop the new business plan for wireless area.
He launched “Wireless Info Venture Company” in January
2004

Concept Principle & Advantage

- Trilateration by the Direct Wave Detection against the Multi-path Influence
- No additional Hard/Software Needed on .11b Target Clients



TDOA:
Time Difference Of Arrival
Wireless Trilateration



Many Location aware Applications

Wireless Firewall

Access permission by location

Tracking

Track Goods or Worker

Mobile Printing

Auto-connect to the nearest Printer

Concept Principle & Advantage

AirLocation Performance vs Alternatives

	Method		Where	Speed	Origin	Requirements
	Method	Error (m)				
W - LAN	TDOA	1 - 3 *	In/Outdoor	11Mbps	Hitachi	Dedicated Base Station
	RSS	1 - 20			A	Calibration
GPS	GPS	3 - 200	Outdoor	—	many	Satellite tracking
cdma One	A-GPS	3 - 50	In/Outdoor	64kbps	B	Carrier Service
	TDOA	50 - 200				
PHS	RSS	40 - 70	In/Outdoor	64kbps	C	Carrier Service
RFID	RFID	1	In/Outdoor	-	many	Tag Reader

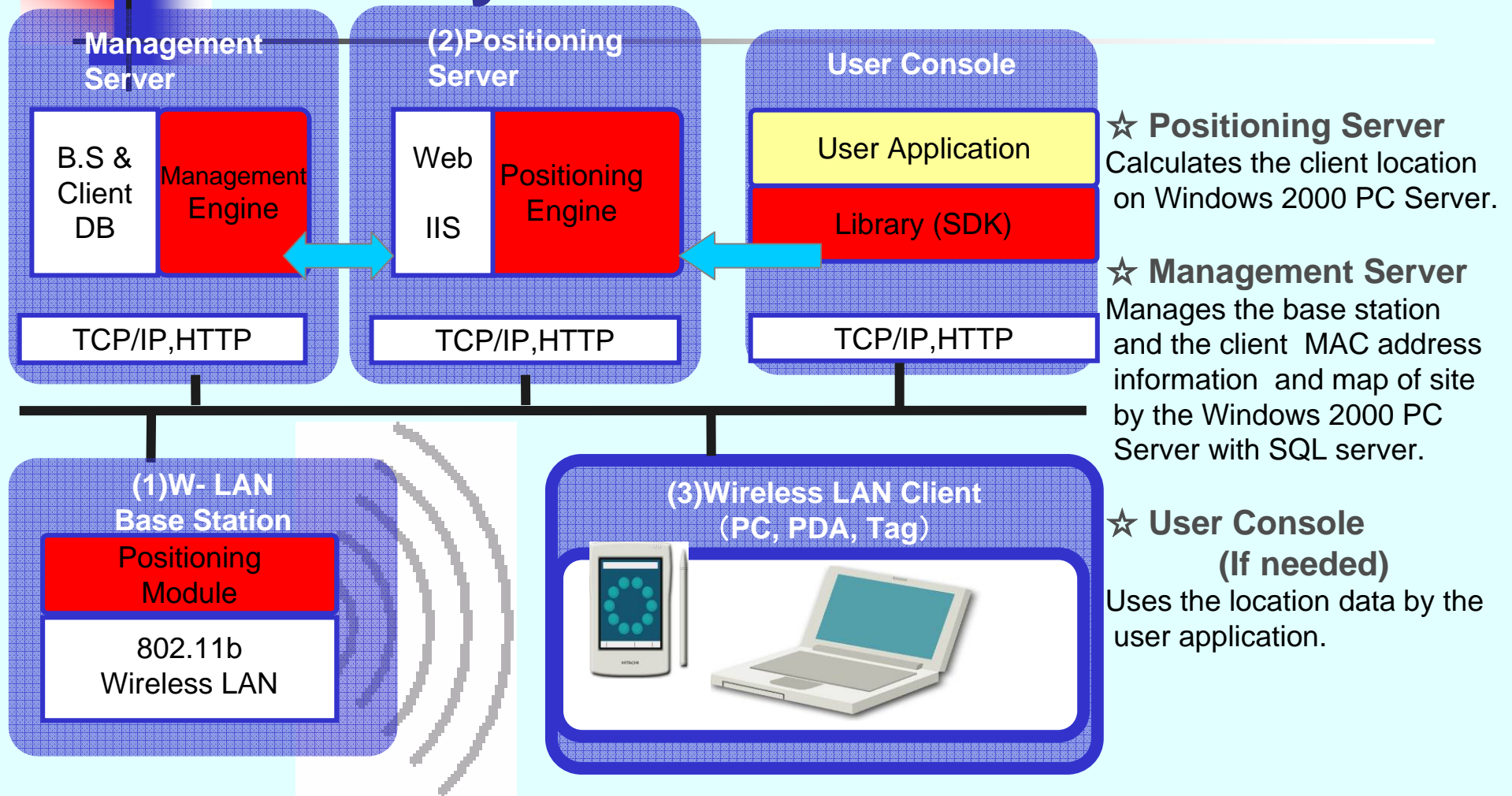
* With Hitachi Original Direct measuring

A-GPS: network Assisted-GPS,
TDOA: Time Difference Of Arrival
RSS: Received Signal Strength

Advantages

- (1) Can be used for both Indoor and Outdoor
- (2) Accuracy: 1- 3m. Response: 0.5sec. per client
- (3) Simultaneously with 11Mb Data Communication

Total System Architecture



☆ **Positioning Server**
Calculates the client location on Windows 2000 PC Server.

☆ **Management Server**
Manages the base station and the client MAC address information and map of site by the Windows 2000 PC Server with SQL server.

☆ **User Console (If needed)**
Uses the location data by the user application.

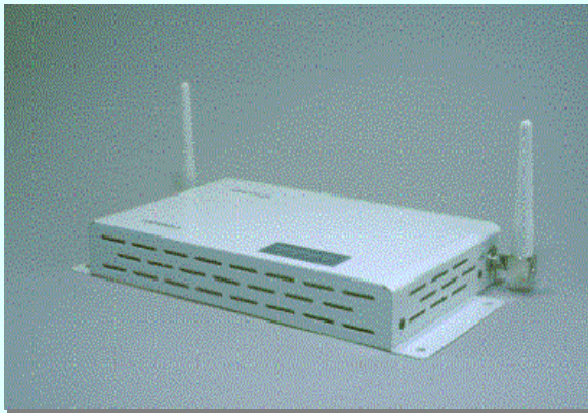
☆ **Wireless LAN Base Station**

Wireless LAN Access Point with Positioning Module. At least 4 Base Stations are needed.

☆ **Wireless LAN Client (Normal .11 standard devices)**

Any Wireless LAN device that supports IEEE802.11b such as PC, PDA, and wireless tag.

WLAN Base Station / AirLocation Tag



- WLAN Base Station Includes the Positioning Module with a Standard 802.11b Wireless LAN Access Point
- Can Detects the Target Client Positions with the Positioning & Management Server



- AirLocation Tags are 802.11b compatible.
- Real-time Tracking for moving object.
- Adaptive location sensing available with motion sensor.
- Rechargeable battery for long tag life.

Demo in Hitachi IT Convention



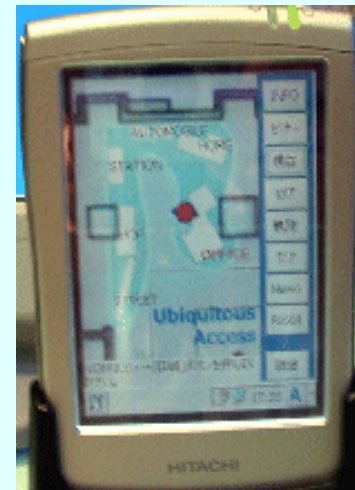
Booth of the Ubiquitous Town
(Appx. 20m by 25m)



Base Station (IEEE802.11b)



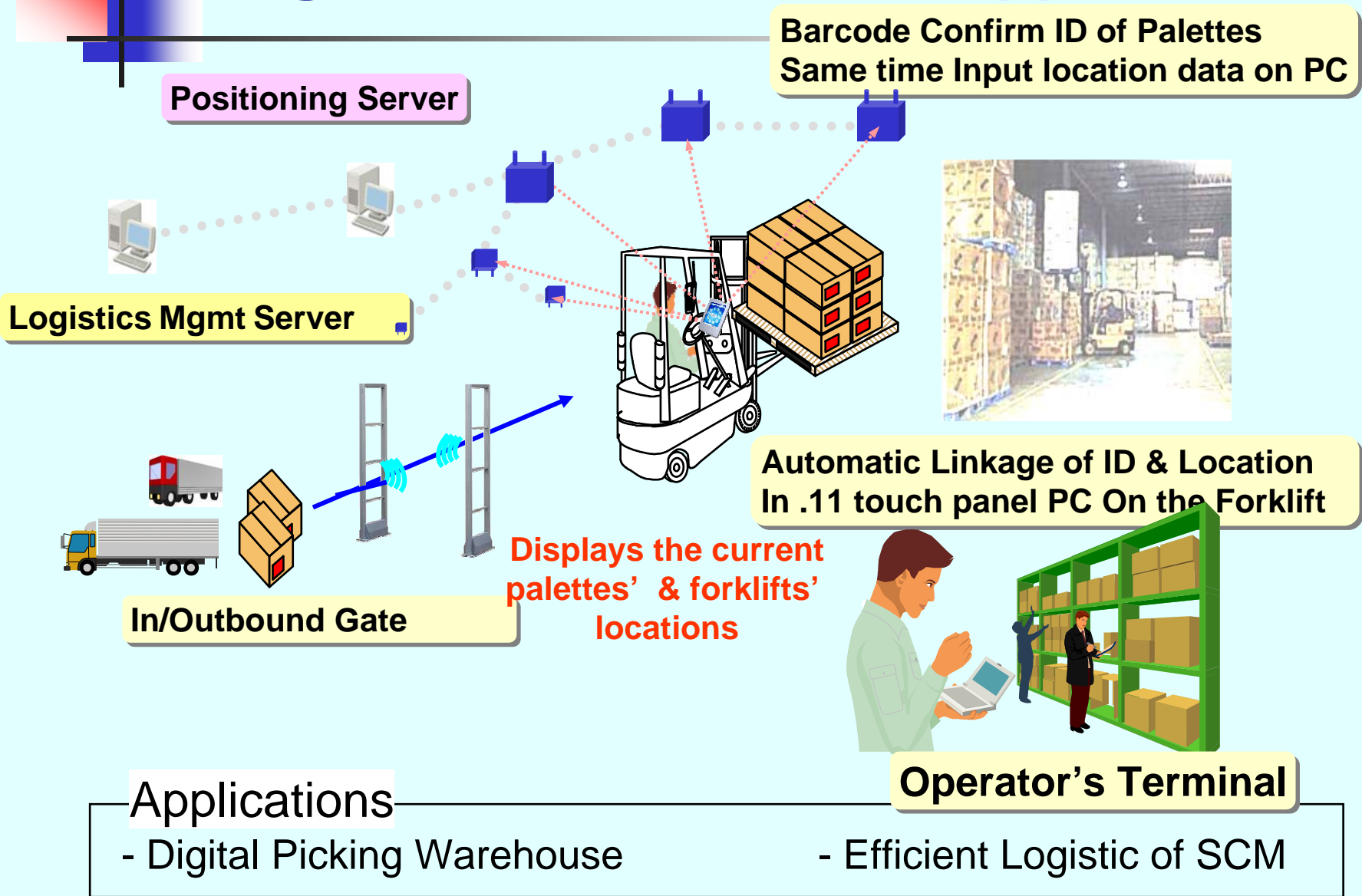
User Console (Up)



W-LAN Client (Left)

Attendance rent a PDA at entrance.
The red point shows the client position.

Logistics & Warehouse Applications

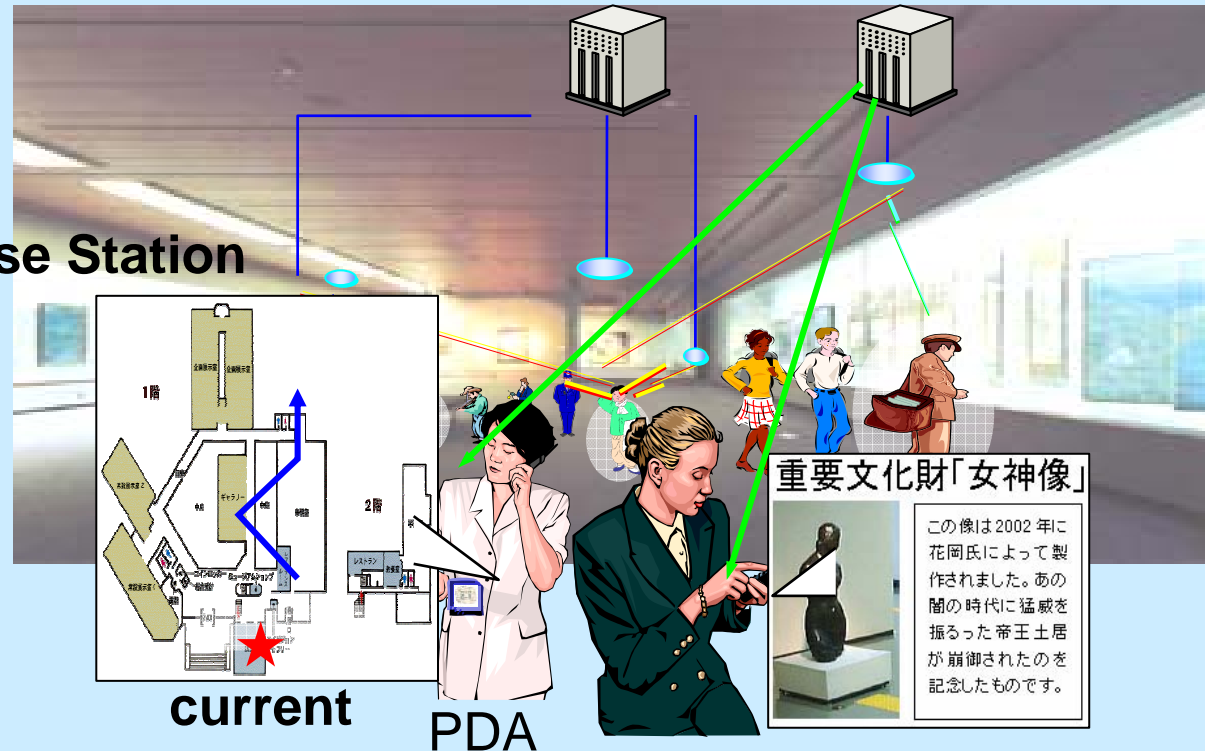


LBS (Location Based Information) Applications

Management and Positioning Server

Contents Server

Base Station



Applications

- **Airport**, Museum, Event Hall, Theme park, Shopping Center
- **Navigation**, **Tracking data analysis**, POP Information



Conclusion

- Mu-chip
 - The world's smallest RF-ID tag
 - Auto Identification, Authentication, Traceability
 - Item tagging is emerging

- AirLocation
 - Can be used for in-door service
 - Localization with 1-3m accuracy
 - Location has many business opportunities

- Building New Business
 - New Business requires patience
 - Early adopter who understands real issues



Q & A

Any question?

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