

RFID-based Information Management Service System Architecture

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In this presentation

- Introduction – Auto-identification and RFID
- RFID-based data collection
- RFID-based Information Management System
 - Proposed system architecture
 - Demo scenario and data model
 - Query design and implemented interfaces
- Conclusion

Automatic Identification (Auto-ID)

- Objective
 - To provide information about people, animals, goods and products in transit
 - Synchronization of physical objects and digital information about them

Barcode label

- May be very cheap
- But, Low storage capacity and impossible to reprogram

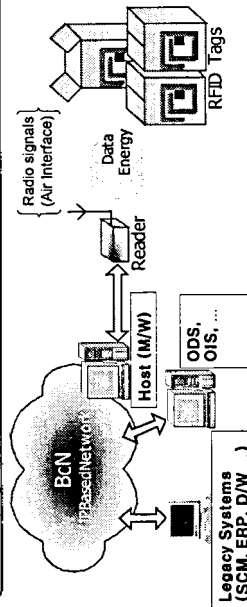
Smart Card

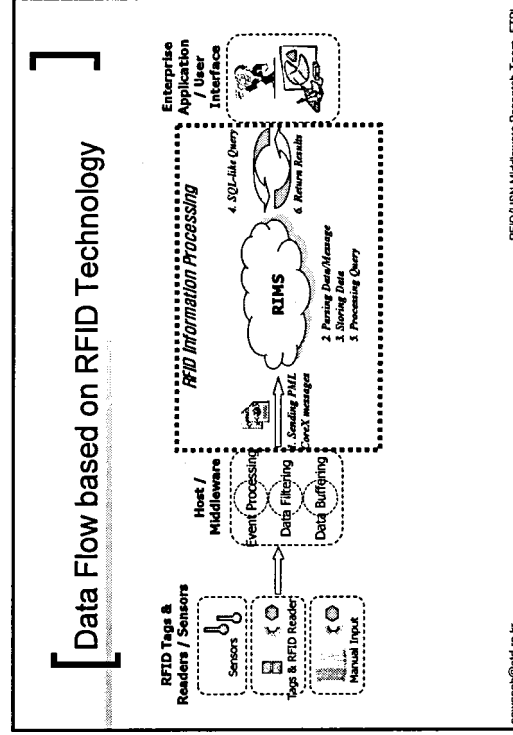
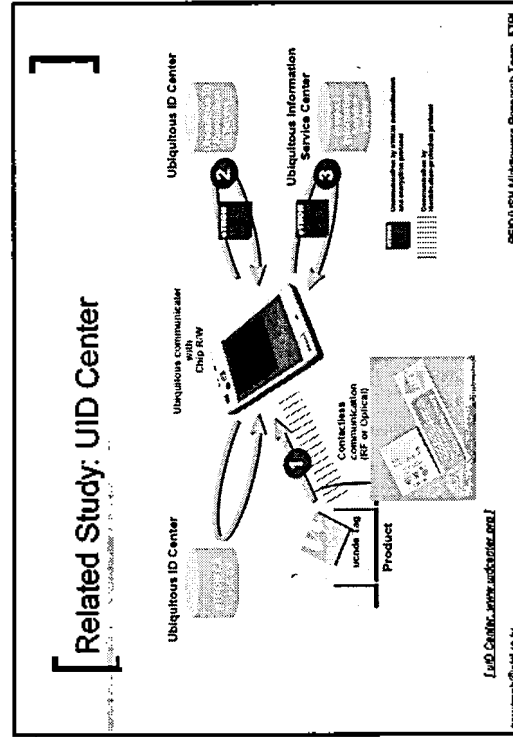
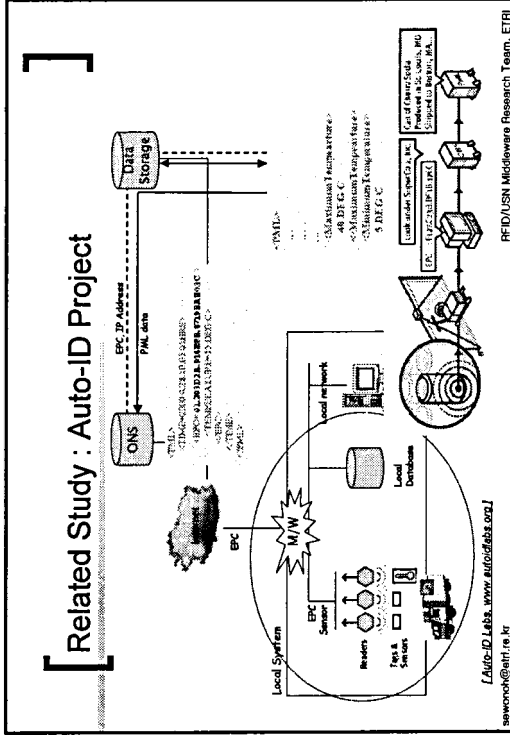
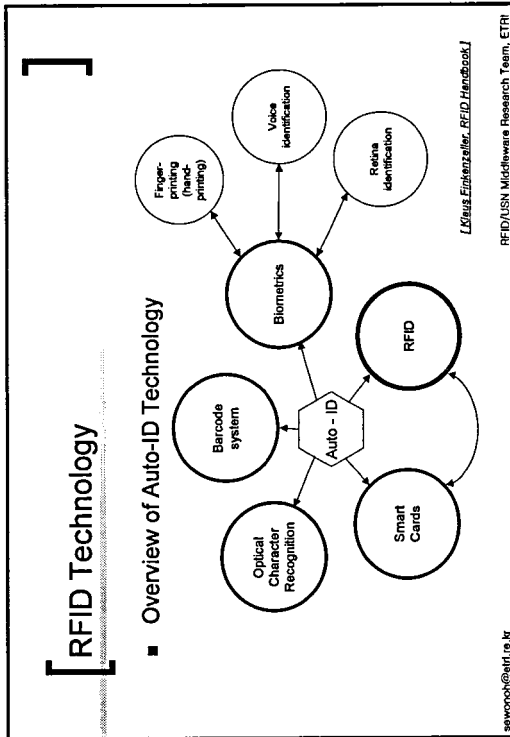
- Storage of data in a silicon chip
- But, mechanical contact is often impractical

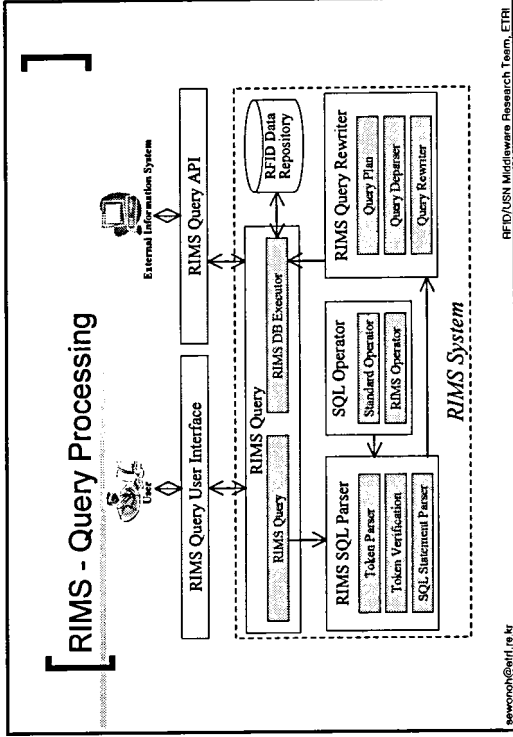
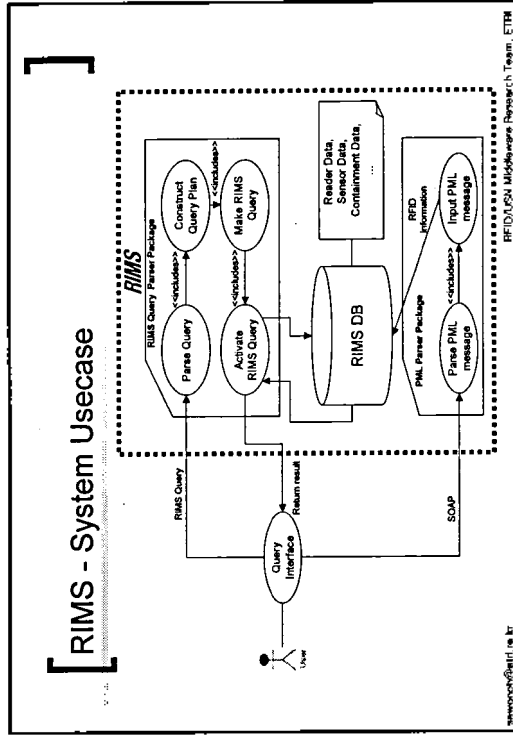
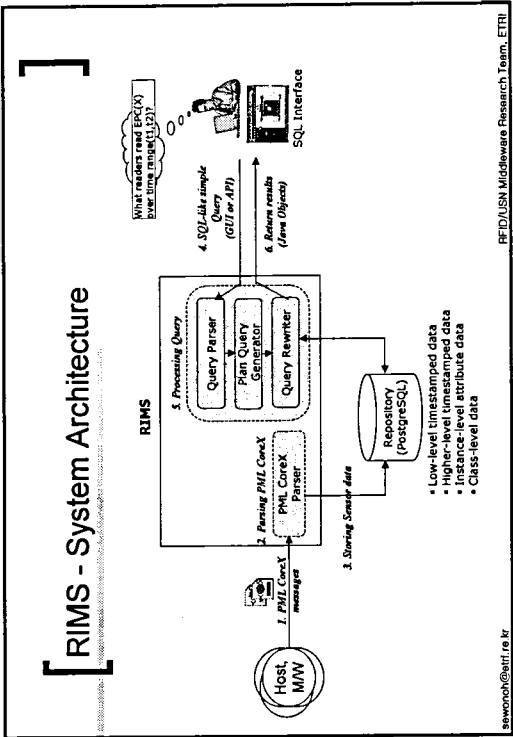
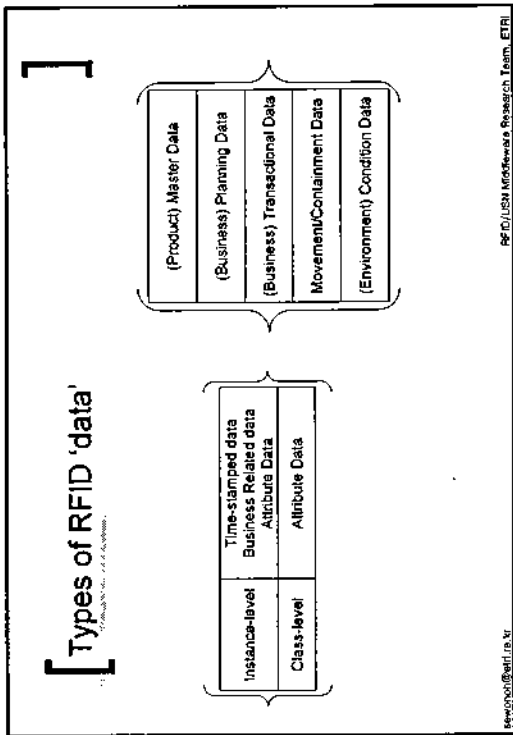
RFID Technology

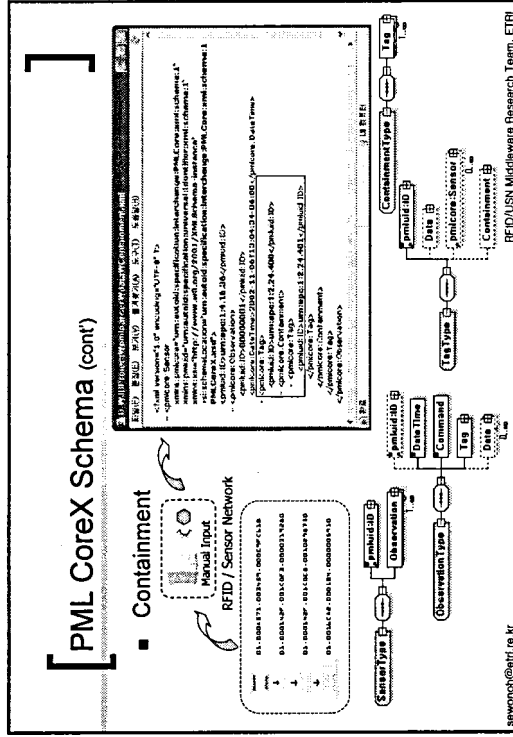
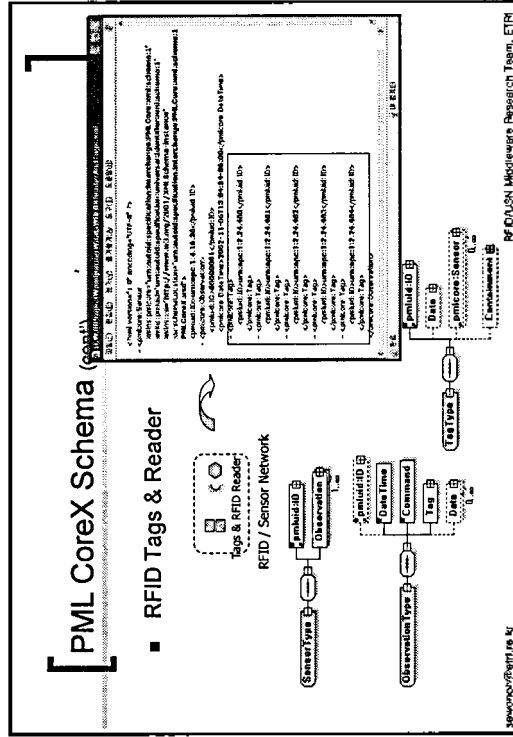
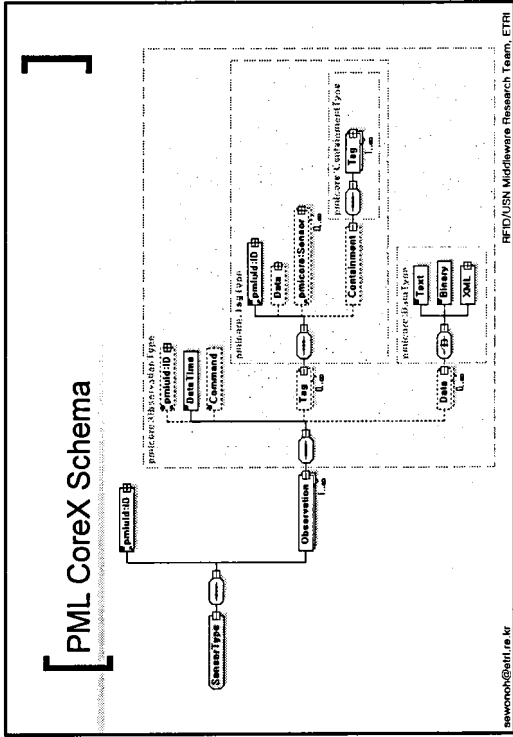
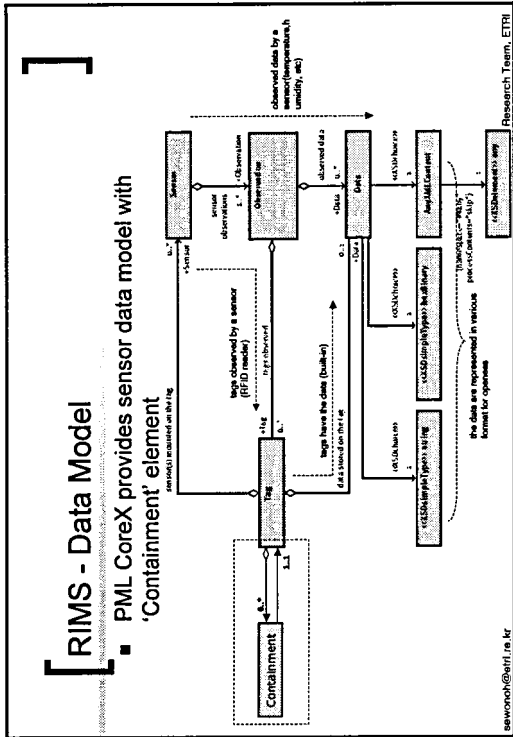
RFID stands for Radio Frequency Identification

- Transferring of data and power, using contact-less technology
- Complementing the limitation of barcode and smart card









[PML CoreX Schema (cont)]

Sensors

RFID / Sensor Network

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[RIMS - Database Schema (Example)]

ObservedTime	ObjectEPC	ReaderID	T_Time
2004-11-05 13:00:00	324400	51839	2004-11-05 13:01:00
2004-11-05 13:00:00	224401	51839	2004-11-05 13:01:10

ObservedTime	Value	SensorID	T_Time
2004-11-05 13:00:00	30	51839	2004-11-05 13:00:02
2004-11-05 13:00:01	3011	51839	2004-11-05 13:00:03

ContainerID	ObjectEPC	ReaderID	T_Time
2004-11-05 13:10:00	324400	51839	2004-11-05 13:10:51
2004-11-05 13:10:00	324401	51839	2004-11-05 13:10:02

SensorID	Measurement	Unit
51839	Temperature	K
51837	Humidity	%

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[Demo Scenario]

1. Start PML CoreX Parser
2. Send PML CoreX messages
3. Parse PML CoreX
4. Store sensor data

DBMS version: PostgreSQL 7.4.5

Parser: DOM
JDBC Driver version: JDBC 3

Repository (PostgreSQL)

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[Query Design using Operators (1)]

- About EPC
 - What readers read EPC(x) over time range (t1,t2)?

```

Select rd.ReaderID
From ReaderData as rd
Where rd.ObjectEPC = x and rd.ObservedTime >= t1 and rd.ObservedTime <= t2
  
```

```

Select ReaderID
From ReaderData
Where ObjectEPC = x and Range(t1, t2)
  
```

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[Query Design using Operators (2)]

- About Containment
 - "What is the immediate children of EPC (x) over time range (t1,t2)?"
 - "What is the grandparent of EPC (x) over time range (t1,t2)?"
- About Sensor
 - "What is the first value of sensor (s) over time range (t1,t2)?"
 - "What is the last value of sensor (s) over time range (t1,t2)?"
 - "What is the maximum value of sensor (s) over time range (t1,t2)?"

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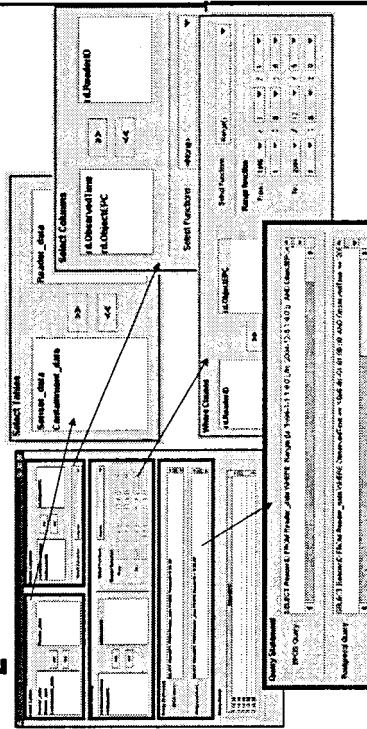
[Operators - Containment Relationship]

- ImmediateChildren()
- ImmediateParent()
- Count_ImmediateChildren()
- Count_ImmediateParent()
- GrandParent()
- GrandChildren()
- GreatGrandParent(= Terminal)
- GreatGrandParent(int n)
- GreatGrandChildren(int n)
- Sibling()
- Count_Sibling()
- Ancestor()
- Descendant()
- Root()
- CountLeaf(= Terminal)
- CountAllLeaf()

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[RIMS - Query GUI]



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[Conclusion]

- Conclusion
 - RFID technology enables efficient data collection
 - Advantages and benefits would be from managing these data
 - RIMS system is proposed and its prototype is developed
- Further Research
 - Implementing for real-world business like Maritime shipping logistics
 - Processing streams of sensory data
 - Applying context-awareness technology to the collected data

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