LG히다찌

Global Logistics Information Synchronization technology for QoS

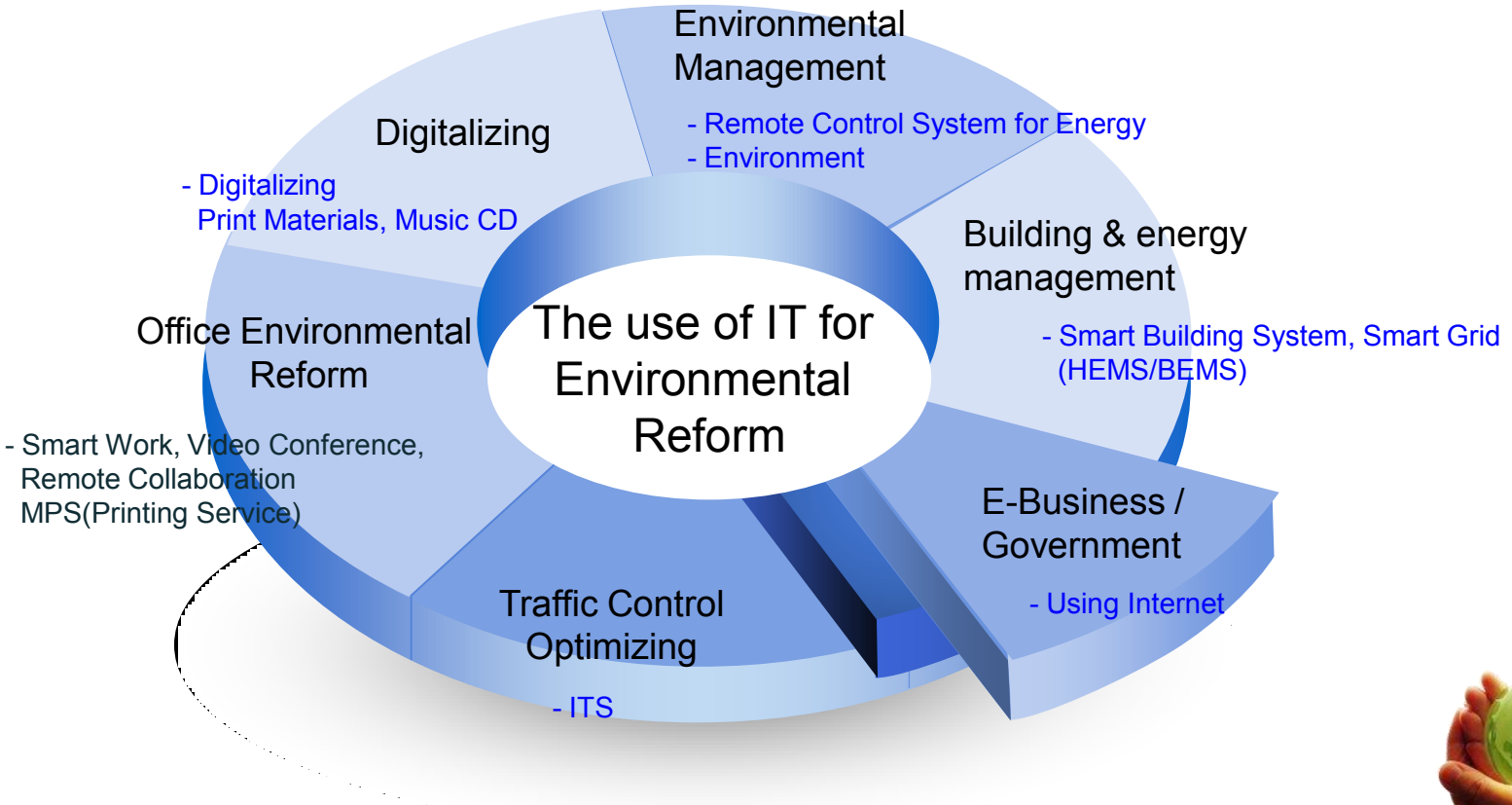
High reliability based Synchronization technology for RFID infrastructure

2012. 4. 25

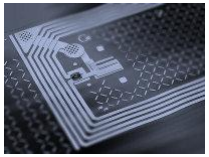
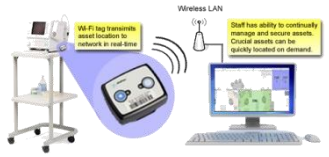
IT Applications for Environmental Reform

Develop innovative energy-saving technologies …

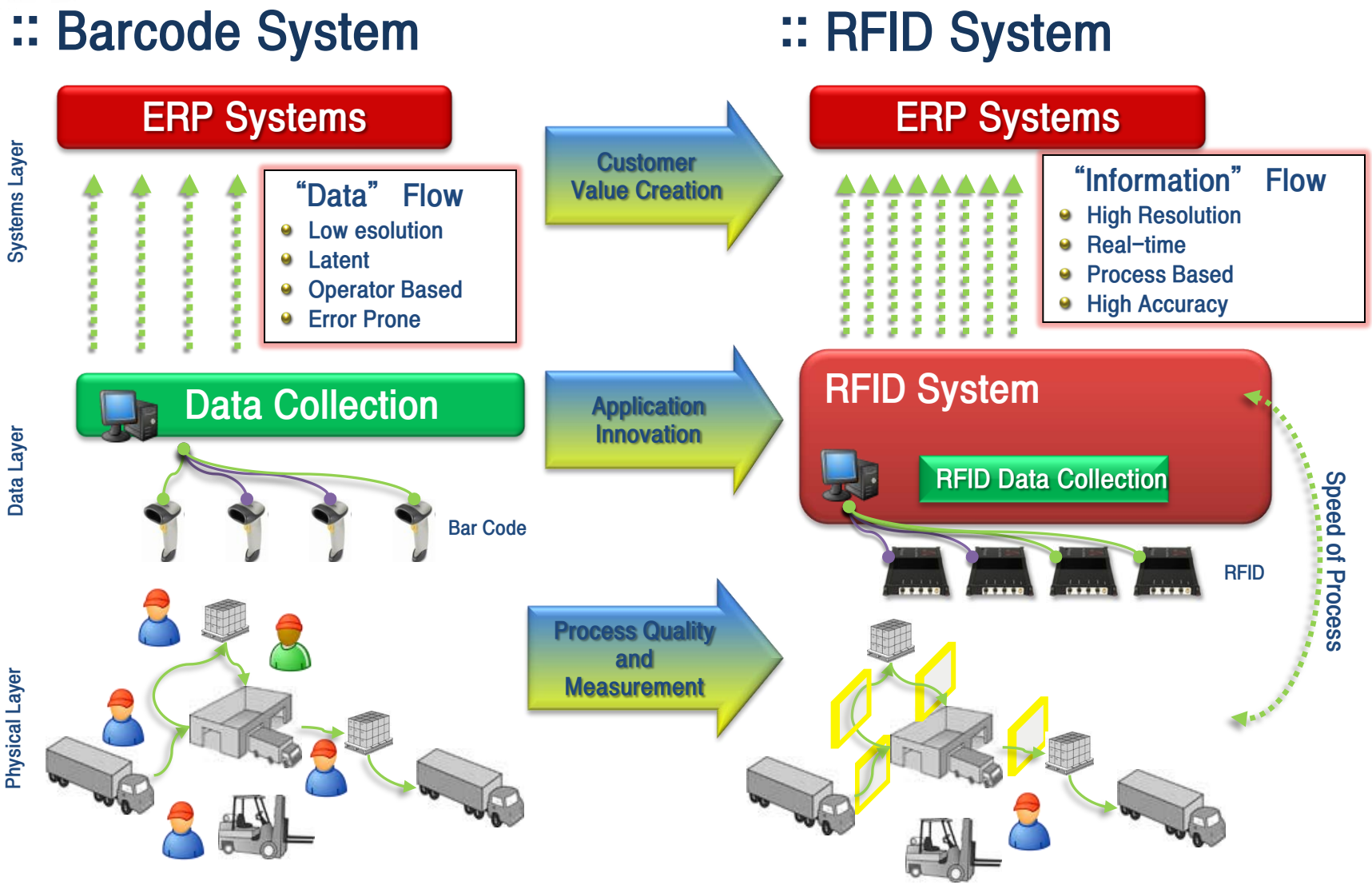
Improvement of Society, Economy, Public Service, Enterprise Environmental Sustainability



1. Overview … RFID/USN Applications for Green ICT

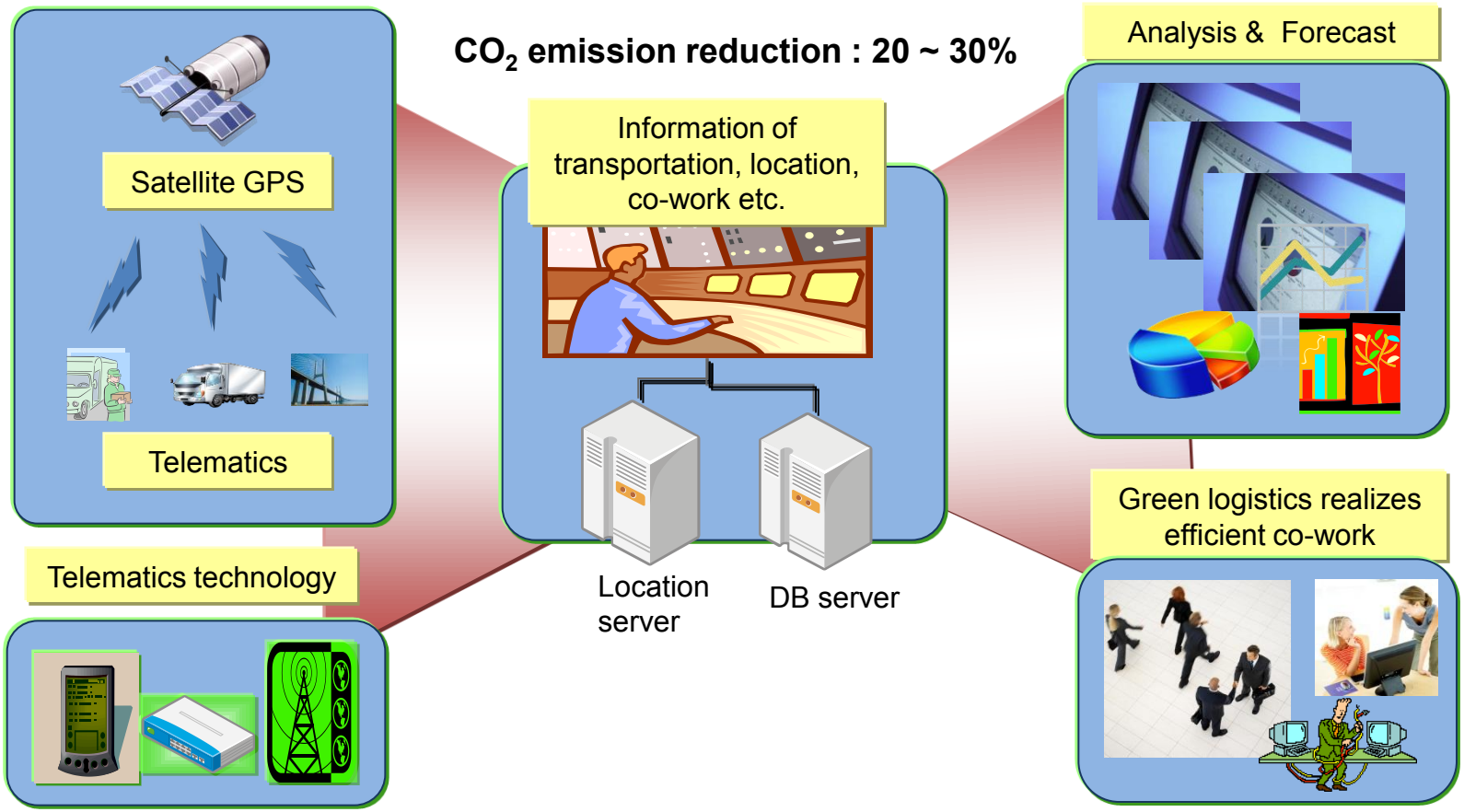
Criteria		Application	Contents
Asset Tracking 	 	Supply Management	Smart logistics
		Baggage Management	Baggage Tracing system
		Plant Automation	Factory Automatic system
		Real-Time location System	Global position tracking
		On-Demand Management	Book, DVD, Cloth etc. rental
Security		Access Control & Security	Access card system
		Car security	Antitheft device & Start engine by ID
Transportation		Automatic Toll	Automatic Identification
		Transportation card	Automatic transport fare

1. Overview … Smart Logistics



1. Overview … Smart Logistics by Green ICT

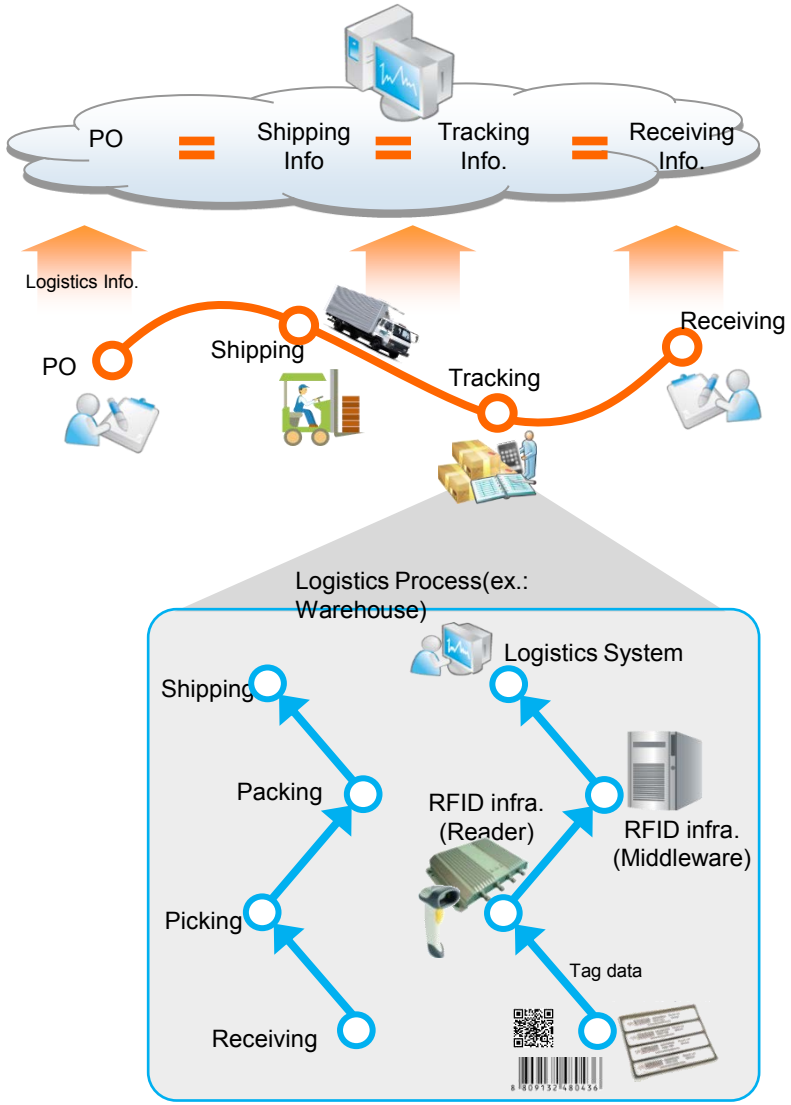
Reduction 23% of CO_2 emission in the Transportation.
Efficient Logistics of Smart Logistics by Telematics and GPS implementation



2. Background

What is Logistics Information Synchronization Technology?

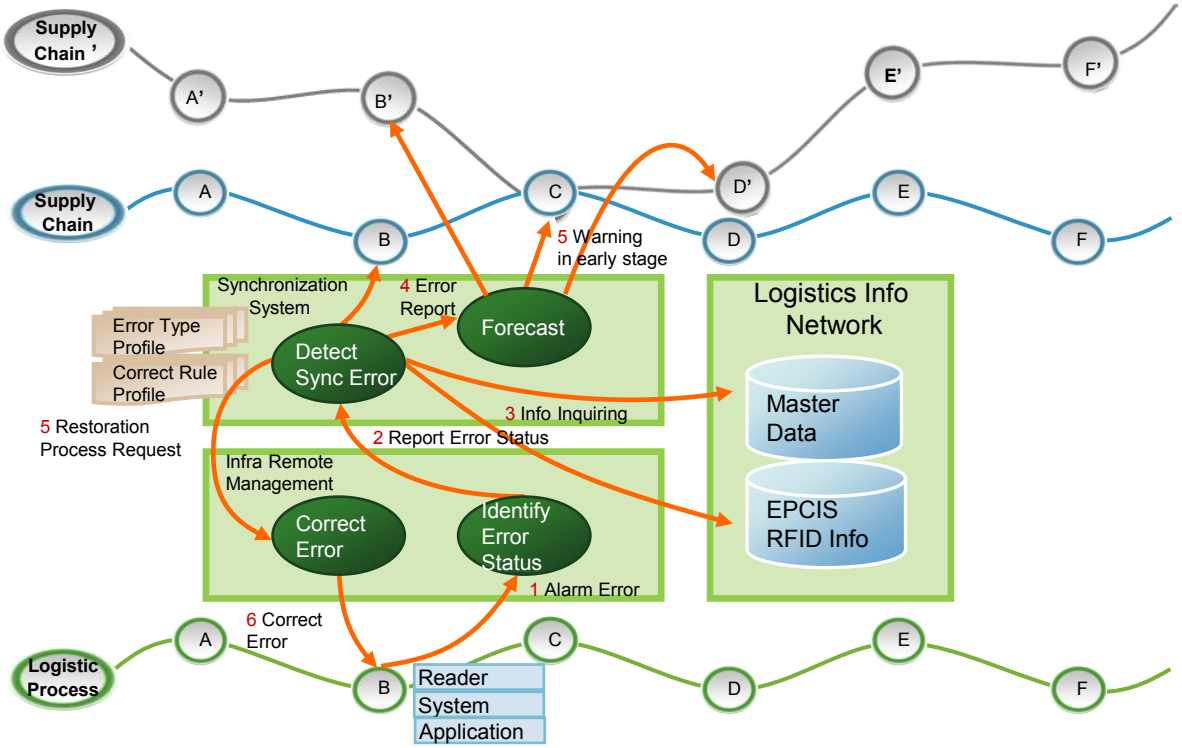
- Logistics Information Synchronization Technology synchronizes the current incorrect data with the correct data in previous logistics step by real time colleting, comparing, and analyzing logistics information occurs in each logistics step in full supply chain.
  - synchronizes the logistics information by detecting and correcting the logistics information(item, Quantity, type of Packaging, Destination, Receiving date) from the purchase order, shipment information from the factory and warehouse, and tracking information from the shipment.
  - synchronizes receiving and releasing logistics information(item, quantity) collected from RFID infra. in one logistics process.
- Logistics Information Synchronization Technology also prevents the logistics information error caused by RFID infra. by real time monitoring of RFID infra. malfunction.



2. Background

Procedure of Logistics Information Synchronization

- By comparing logistics info. collected from logistics info. network and logistics info. collected from RFID infra., GLIS Takes action against the cause of logistics data error, and restores error
- By notifying the front and the rear supply chain, GLIS deals with other supply chain sharing with the corresponding logistics process



2. Background

Need of Logistics Information Synchronization

Manufacturing base Diversification & Global sourcing Expansion → Supply chain Diversification & Supply Chain Complexity → Supply chain Error & Supply chain Cut off → Lack of Real time Logistics Info. Synchronization

Change on SCM System

Complexity

Supply chain related with many vendors

- Ratio of outsourcing: 78.8% (Avg. of manufacturing business: 68.8%)
- Supply chain related with 1st Vendor(300~400each) & 2nd Vendor(600each)

Global

Diversification of finished automobile manufacturing base & Expansion of global sourcing

- Expansion of supply chain due to diversification of automobile manufacturing base
- Complexity of global sourcing supply chain
- Since year 1998, Domestic finished automobile manufacturer export sales exceed domestic sales (export sales: more than:70%)

High Cost

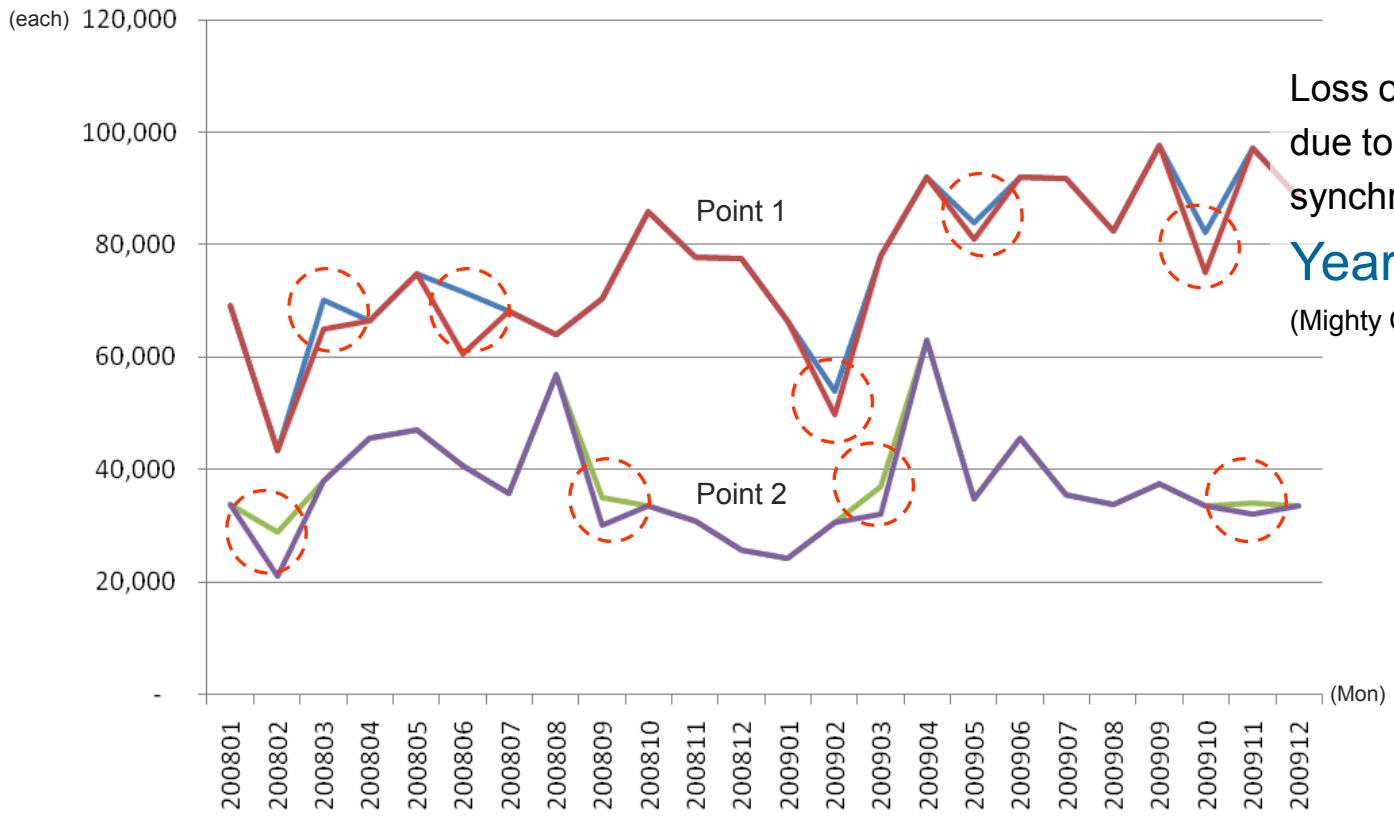
High cost for maintaining supply chain

- High cost of maintaining & building network for collaborating with business participants
- High logistics cost to operate in each supply chain(private vehicle, stock)

2. Project Background

Need of Logistics Information Synchronization

Incorrect product demand occurs
due to difference between actual logistics & data collected by RFID infra.



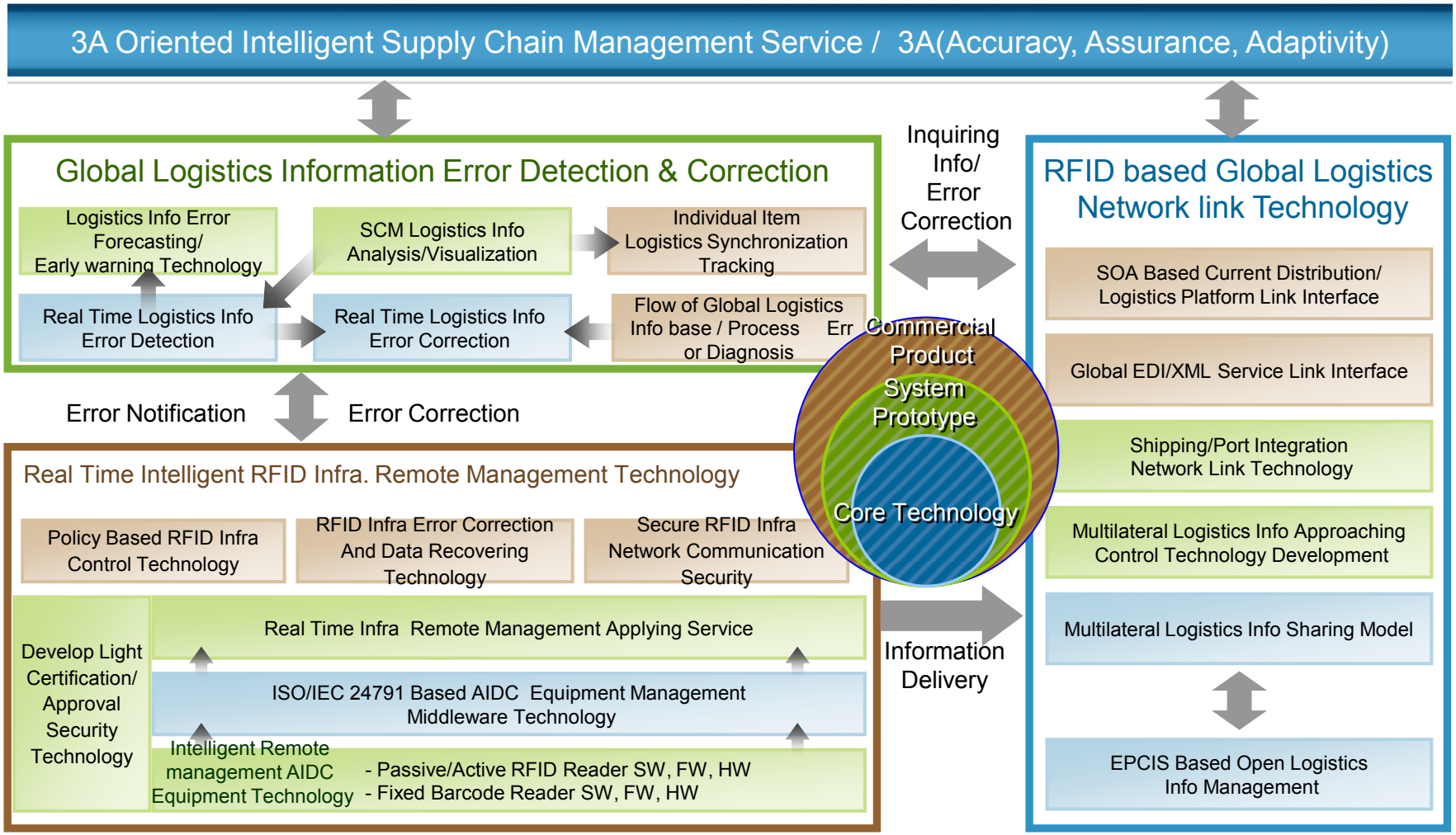
Loss of global sales opportunity due to failure of logistics info. synchronization

Yearly 219 Trillion Won

(Mighty Card, 2008.9)

3. Objective

Contents of technology development



4. Primary Technology

4-1. Development of core technologies for real time intelligent RFID infra.

① Intelligent 900MHz AIDC equip. development

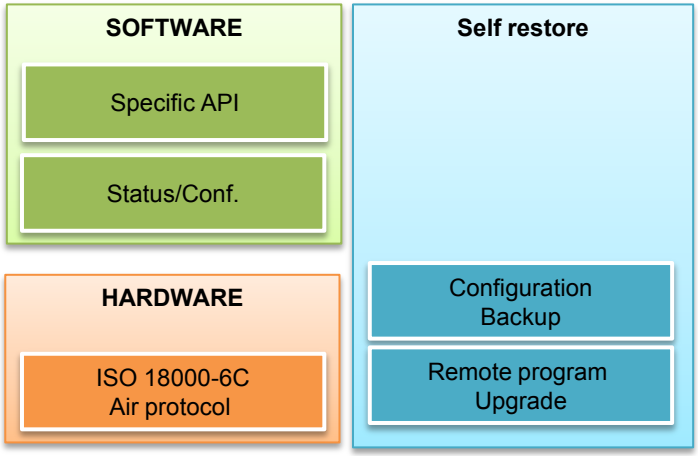
Definition

- 900MHz passive RFID Reader supporting real time remote management
  - Developing ISO/IEC 24791 based equipment control & management
  - Supporting real time monitoring & controlling
  - Real time remote management & monitoring for equipment status(antenna, RF, over load, system temperature)

Current

- Info. Collecting equip. to read tag info and transmit data to system
- Remote monitoring and controlling reader status are in development stage (ISO/IEC24791)
- Intelligent reader development is in progress by global major companies

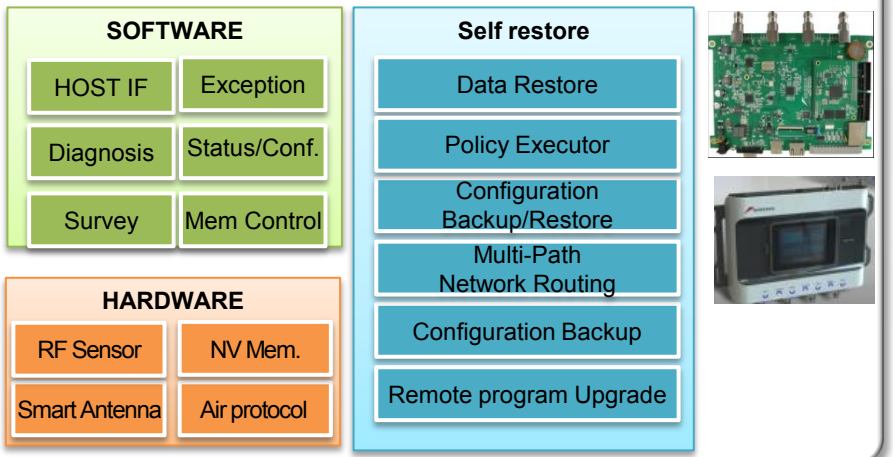
< Passive RFID function block diagram >



Output

- Design & develop reader S/W supporting ISO/IEC 24791-3(equip. management)
- Design & develop reader FW/SW supporting ISO/IEC 24791-5(equip. control interface)
- Complete Passive RFID HW diagram & circuit design, and build & verify test PCB
- Secure possible application method for mobile & detachable RFID reader

< Technology development output >



4. Primary Technology

4-1. Development of core technologies for real time intelligent RFID infra.

② Intel Intelligent 433MHz AIDC equip. development

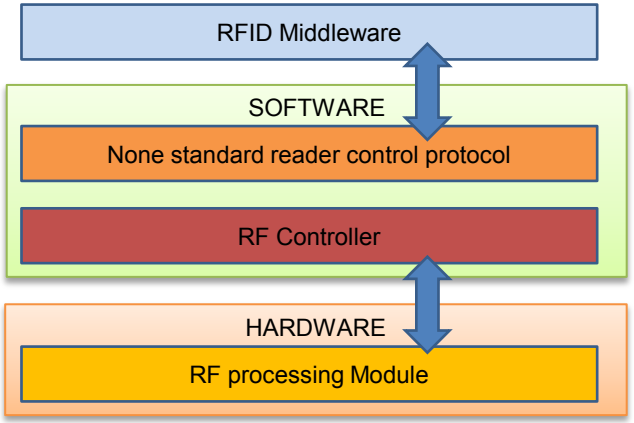
Definition

- 433MHz active RFID Reader supporting real time remote management
  - Developing ISO/IEC 24791 based equipment control & management
  - Providing the feature of AIDC equip. real time monitoring & controlling
  - Providing high reliable AIDC equip. management feature by developing EPC Global RM/MIB based equip. management S/W

Current

- Info. Collecting equip. to read tag info and transmit data to system.
  - No method of remote monitoring reader status
  - No controlling & managing reader protocol for active RFID

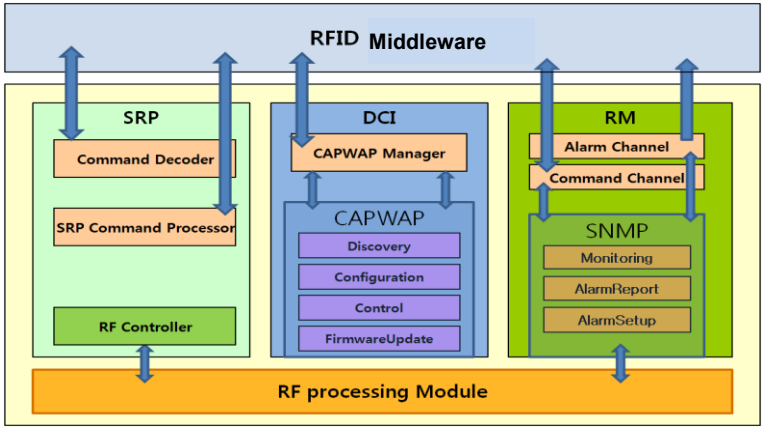
< Active RFID function block diagram >



Output

- Structure design & develop active AIDC equip. management, monitoring, and controlling module
- Design & develop ISO/IEC 24791-3 based AIDC equip. management module
- Design & develop ISO/IEC 24791-5 based equip. control interface module
- Develop active AIDC equip. self status diagnosis feature

< Technology development output >



4. Primary Technology

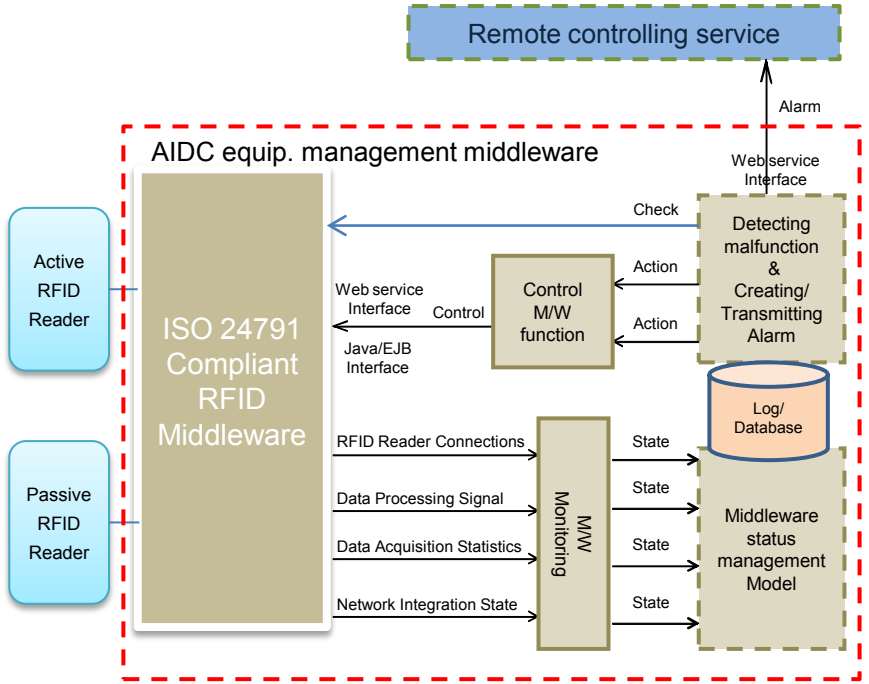
4-1. Development of core technologies for real time intelligent RFID infra

③ AIDC equip. middleware development

Definition

- RFID middleware, compatible with global ISO 24791 technology, to connect & control active & passive RFID reader
- Provide method of creating alarm info. & transmitting interface by collecting & monitoring middleware operation statistics, and detecting malfunction and operating error

Diagram



Primary contents

- Design and define function specification for RFID middleware monitoring, record keeping, error detecting/dealing
  - Define14 function specification based system requirement
  - Design structure for MMC(Middleware Management Component)
- Collect & execute passive & active reader interface & data
  - ISO 24791-3(DCI, SNMP) based Interface/monitor
  - Automatic collecting RFID tag data using TTA SRP standard
  - Transmitting & creating RFID data report using EPC ALE standard
- Design & develop MMC composition block
  - Method of transmitting RFID reader error alarm info.
  - Controlling and monitoring RFID infra. equip. & network link
  - Operation monitoring for collecting/executing RFID data
  - Operation monitoring fro transmitting RFID data report
  - Creating & Transmitting RFID middleware error alarm
- Confirming method development for unit test & system

4. Primary Technology

4-2. Technology of detecting & correcting Logistics Info. Synchronization error

Definition

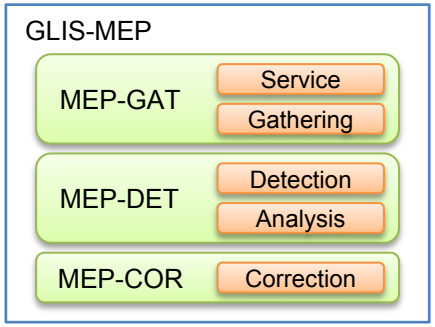
- Technology to correct logistics info. error by detecting logistics info. error occurs in supply chain and logistics info. error collected by AIDC equip in supply chain, and comparing with other info. such as initial PO info.

Current

- There have been vitalizing Research & development of RFID based tracking & visibility technology of logistics info, and consolidation framework by advanced country. Yet, there is no case of studying technology for detecting & correcting RFID related error

Outcome

- Provide solution for problem regarding detecting/correcting logistics info. synchronization error
- Provide method to speed up detecting/correcting info. error in automatic logistic system
- Contents of primary technology development
  - Develop core technology for detecting/correcting global logistics info. synchronization error
  - Standardize logistics info. synchronization error type
  - Design algorithm for detecting/analyzing/correcting logistics info. synchronization error
  - Design system for detecting/correcting logistics info. synchronization error (define requirement, structure design)
  - Design structure & system interface for detecting/correcting logistics info. synchronization error



- MEP: Management & Enforcement Point
- GAT: Logistics Info. collecting component
- DET: Logistics Info. synchronization error detecting component
- COR: Logistics Info. synchronization error correcting component

4. Primary Technology

4-2. Technology of detecting & correcting Logistics Info. Synchronization error

Definition of error type (example)

- GLIS system automatically restores error according to type of error. If GLIS system unable to restore error, GLIS notifies the person in charge to help correcting the error

< Type of active RFID reader error >

Type of Error		Cause & Status
Reader Interference		• Reader or device using same frequency range exist around the corresponding reader. • RF communication is abnormal due to RF frequency interference • Receiving data is meaningless or data error occurs due to damage of partial data • Miss transmission of data occurs due to loss of data • Loss of data occurs due to data recognized as abnormal. This caused by damage of CRC part of RF. Eventually it leads to miss transmission of data
Reader Down	OS Down	• Abnormal operation of reader occurs due to reader embedded OS Down
	Power Down	• Malfunction of Reader occurs due to disconnection of the reader's power
M/W connection loss		• Communication with middleware is abnormal due to physical line problem, or socket problem in Software / reader OS
Antenna disconnection		• Communication is not working due to disconnection of the antenna.

4. Primary Technology

4-3. Development of logistics info. Network interface technology

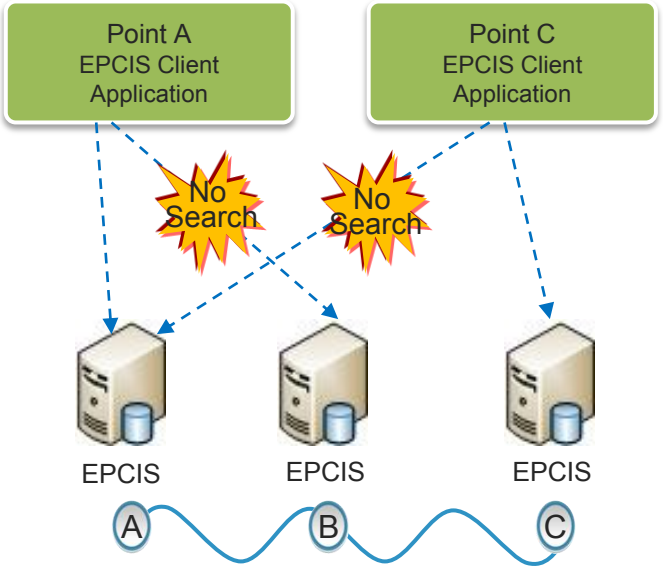
① EPCIS based open logistics info. management technology

Definition

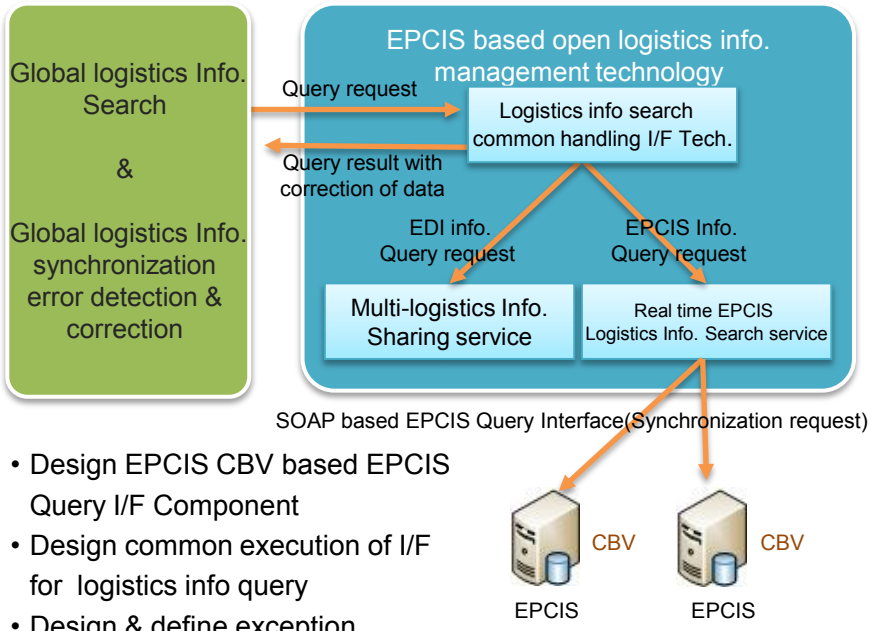
- Develop RFID logistics Info. network interface technology which enables to share and distribute Logistics info. occurred by the different logistics entity involved with global supply chain
- Develop EPCIS error correction method

Current

- Impossible to query consistently due to absence of standard CRV for logistics entities
- Impossible to correct EPCIS data error in each logistics point



Output



- Design EPCIS CBV based EPCIS Query I/F Component
- Design common execution of I/F for logistics info query
- Design & define exception handling for exception caused by external EPCIS I/F

4. Primary Technology

4-3. Development of logistics info. Network interface technology

② Multi business Intelligence logistics Info. sharing service

Definition

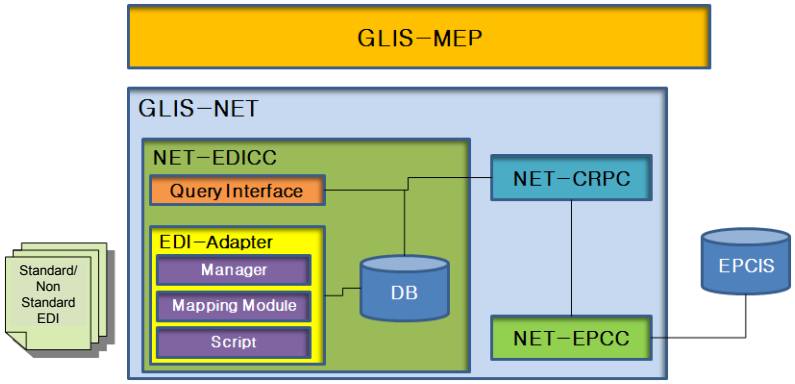
- Develop module to share info. electrically for inter-verification of logistics info, when synchronization error occurs
- Develop Smart EDI Query Interface (SEQI) to synchronize between EDI data and RFID data

Current

- Use of standard EDI is universal in Import & export port logistics
- Use of non standard EDI is universal in in-land logistics
- Developing standard interface to synchronize and share Non standard / standard EDI info & RFID info. is requested

Outcome

- Develop EDI Adapter to share EDI data in SCM
- Develop non standard EDI document (use of EDI from test bed) execution logic
- Define converting rule for the non standard EDI
- Define logic to commonly apply to the non standard document
- Develop Query I/F to synchronize between EDI data & RFID data



4. Primary Technology

4-3. Development of logistics info. Network interface technology

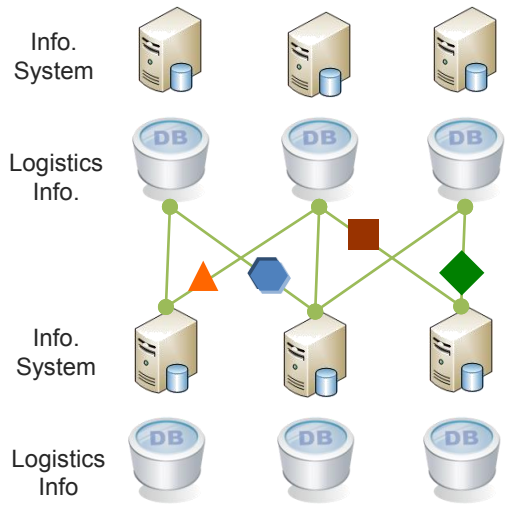
③ Multi business logistics Info. sharing model

Definition

- Define sharing & process security level to limit only authorized personnel to access corresponding logistics info.
  - logistics info. Input/search/save method, logistics info. return method, logistics info. detailed search method, and logistics info referencing method

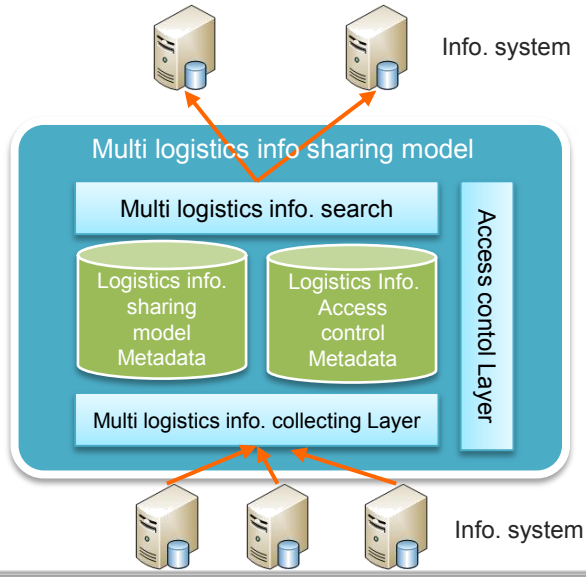
Current

- Need of complex I/F for info. Sharing
- Need of individual development for each company to interface with other companies' Info. I/F



Output

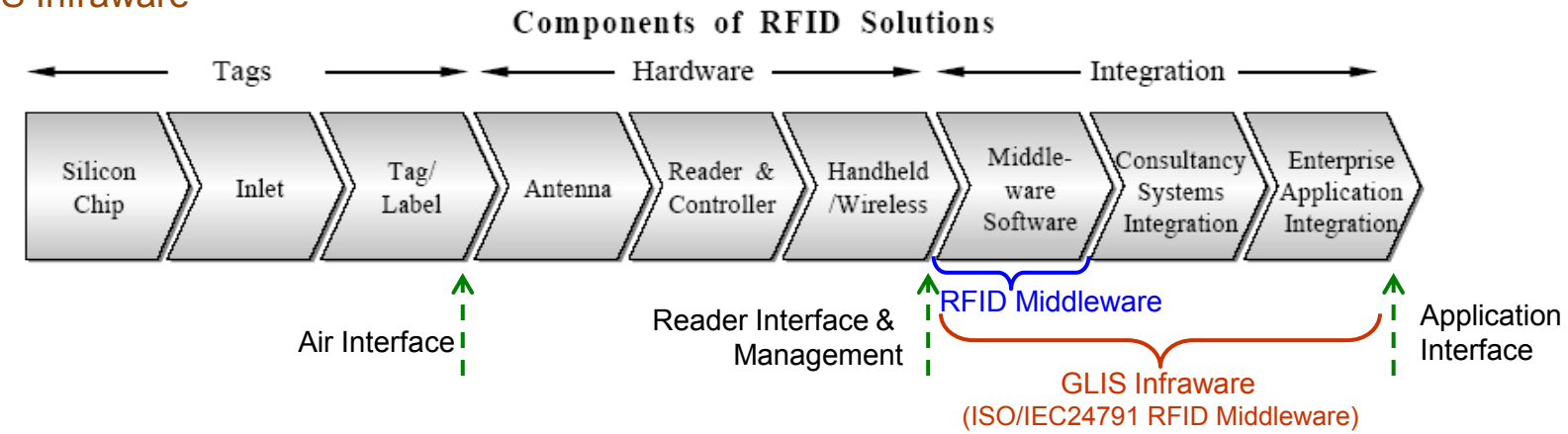
- Define metadata for sharing logistics info for companies involved with supply chain
- Define system architecture for distributing multi logistics info. sharing
- Define I/F standard and technology for safe logistics info distribution



5. Outcome

5-1. Commercialize product & solution

① GLIS Infraware



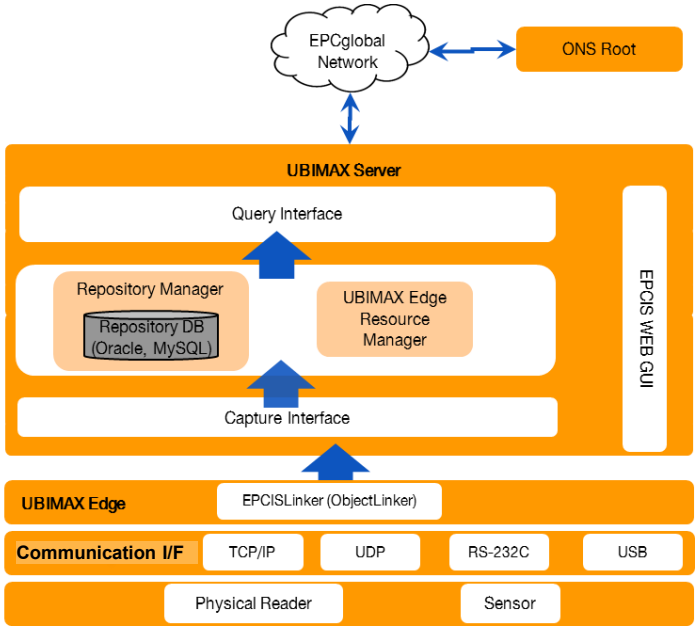
item	Current middleware	GLIS Infraware
Architecture	• EPC network - centered	• Accepting EPC network & non-EPC standard • Accepting mobile RFID technology
Data Management	• ALE 1.0 • Tag Data Standards/Translation • Data filtering, collecting, and summarizing	• ALE 1.1 • Processing user memory & data • Supporting data filtering, collecting, and summarizing
Device Interface & Management	• Possession of adapter to support specific reader • Supporting LRP	• United standard for JTC1 SC31 standard • Controlling Plural & heterogeneous reader(RM, RP, LLRP support)
Application Interface	• Supporting I/F development for different application	• Supporting user request for various tags • Supporting application I/F component
Security		• Analyzing security threat(RFID equip., application, SSI) • Suggesting security mechanism
Scalability	• Recognizing hundreds of tad data at once • Sever base (Centralized process)	• Grid computing base(Recognize thousands tags at once) • Controlling hundreds reader

5. Outcome

5-1. Commercialize product & solution

② GLIS-EPCIS

- GLIS-EPCIS, providing control method though Web GUI, is I/F to exchange & share EPC data and to collect EPC data related to different service
- Composition of EPCIS consists of ‘Capture Interface’, ‘Query Interface’, ‘EPCIS WEB GUI’, and ‘Resource Manager’



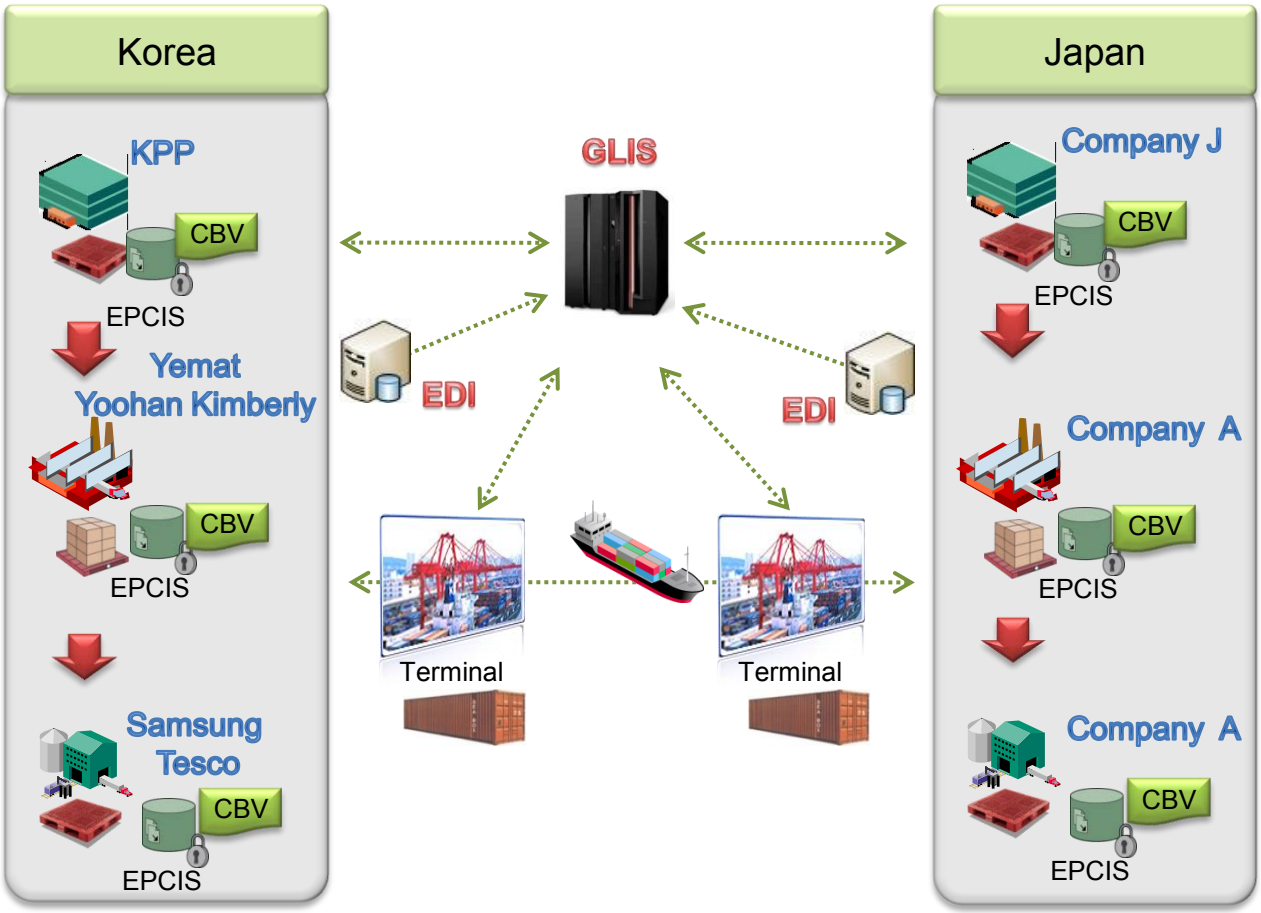
③ GLIS-BPM

- GLIS-BPM is supply chain process management system enables to arrange supply chain model group & RFID infra. in supply chain, and to manage business process, when smart SCM, including logistics info. Synchronization & RFID infra. Management, is built

Main method	Main contents
Supply chain group model management	• Define supply chain composing companies & point(region), and supply chain structure model • Define relation between each resource & role based resource through group structure
Resource model management	• Arrange & register resource for RFID infra. operating in supply chain • Define relation between each resource & role based resource • Create relation between logistics processes in supply chain
Business process management	• Define Biz step(business process) processed in logistics supply chain
Supply chain modeling	• Design process combining group, resource, and business item • Set up swimlane & label to improve readability

5. Outcome

5-2. Test Bed



▶ Inland logistics

KPP → Yemat/ Yoohan Kimberly →
Samsung Tesco → Home Plus

▶ Oversea logistics

Japan Company J →
Japan Manufacturer (discussing) →
Japan Company A Distribution Center →
Japan Company A Sub-Distribution Center

▶ Global export logistics

KPP → Korea Company L → Enter Boosan Port → Exist Japan Port →
Japan Company A Distribution Center →
Japan Company J

▶ Global import logistics

S.T Corporation → Enter Japan Port →
Enter Boosan Port →
Korea Company A (discussing)

5. Outcome (1st Year)

5-3. Quantitative outcome (Archived outcome compare to project target)

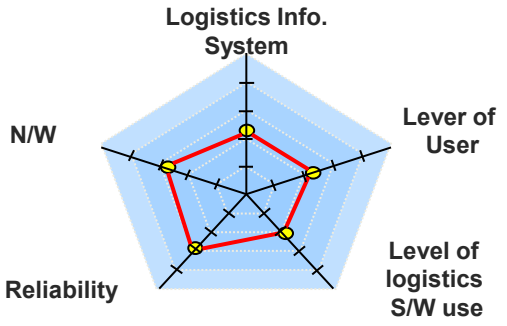
Evaluation Item	Evaluation Unit	Target	Outcome
Level of Global logistics info. visibility	Visibility	Container	• Achieve visibility target to pallet & container unit - Field test : Korea Pallet Pool → Yemat - Expecting Global test bed (2nd Year)
Level of Global logistics info. Synchronization	Synchronization Management	Container	
Detecting Global logistics info. Synchronization error	Accuracy of error detection	90%	• Detecting RFID infra. error (execute 100 times) - Accuracy : 90% - Time required for error detection : 515ms
	Time required for error detection	Less than a day	• Detecting logistics synchronization error (execute 100times) - Accuracy : 90% - Time required for error detection : 422ms
Correcting Global logistics info. Synchronization error	Accuracy of error correction	80%	• Correcting logistics synchronization error (execute 100 times) - Accuracy : 100% - Time required for error detection : 140ms
	Time required for error correction	Less than 2 days	
Remote controlling RFID infra.	Number of different type of AIDC device controlled at once	10 each	• Controlling different type of RFID reader at once : 10 each - Active RFID Reader 1 each - Passive RFID Reader 2 each - Passive RFID Reader Simulator 7 each
	Rate of automation for controlling AIDC device	30%	• Rate of automation for different type of RFID Reader : 36.4% - Succeful unit test for 12 units out of 33 system requirements
	Time required for detecting Antenna malfunction	-	• Time required for detecting antenna malfunction : Lest than 5min. - Test with passive 900㎒ RFID reader prototype - Schedule to test Active 433㎒ RFID reader (2nd year)

Next commercialization plan

- Poor investment environment for logistics related domestic companies
- Logistics cost paid by manufacturer due to small-scale logistics company
- Urgent Need of logistics info. Service for Small & Mid. size Biz company

Expansion of logistics info. Infra based on GLIS technology

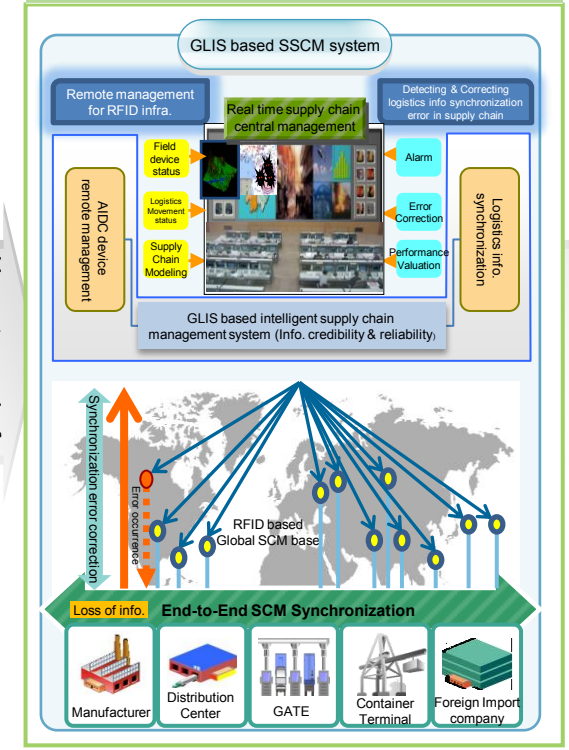
Status of Small & Mid. size Biz. Logistics Company



- **Companies' Revenue less than 5 billion won has low level of Information**
- **Necessary to improve Small & Mid size private logistics company's user level**

Urgent need of Informatization

Research & Development



Expansion based on low cost

Application

Cloud Service for Small & Mid size Biz.

Real-time Logistics Info. Tracing from SSCM

Visibility of real-time logistics info.

SaaS	Intelligent Supply Chain Management System (SSCM)
PaaS	Global Logistics Information Synchronization System (GLIS Platform System)
IaaS	Intelligent RFID Infra. Real-time remote management system

Expected effectiveness of market expansion

Min. Requirement

Logistics point : 4

- Korea → Japan Export
- Reading Point

Reader : 20

- 900㎒ reader : 12
  -fixed 2/Site, mobile 1/Site
- 433㎒ reader : 8대
  -fixed 1/Site, mobile 1/Site

Tag : 700 mil.

- 900㎒ tag : 700 mil.
- 433㎒ tag : 480

System : 4

- GLIS system : 4
  - logistics info. synchronization
  - control AIDC infra.
  - EPCIS and etc.

After year 2013 Expand to 10 products

- Tag 7,000 mil.

THANK YOU

for **attending**

- If you have any further questions, e-mail doowon.lee@gmail.com

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