RFID in China

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Outlines

• RFID hardware basic
• Application
• Industry
• Standard
• Auto-ID Labs
  ➢ Auto-ID Labs worldwide, include at Fudan University
  ➢ Research for application, industry and standard
  ➢ Special Interest Group for adoption of Auto-ID technology in China
RFID Hardware
RFID Hardware

Operating range (X, Y) cm.

Container

Signal

Power

Tag

Signal

Y

X

Reader/Writer antenna

Reader/Writer

Directional coupler

Transceiver-receiver

Reader

Dipole antennae

Transponder

Memory

C1  C2  C3

D1  D2  D3

RL
Application in China

- Identification and access control
- Certification and Anti-fake
  - LPG tank certificate
- Logistic
  - Train car identification
  - Container tracking
  - Manufacturing control
- Animal identification
- Ticketing
  - Highway tolling
  - 2008 Olympic games
  - 2010 Shanghai Expo
National Identification Card

- 1 billion will be issued in next few years
- ISO 14443 Type-B standard
- Picture
Obstacles

• No successful and integrated solutions clearly available in the market
• Standards remain the key challenge
• No early indications of consistent priority application areas for both retailers and manufacturers
• Inconsistencies remain among manufacturers and retailers regarding expectations and business benefits
• Security and reliability of RFID tag
• How to protect the privacy of the customer
Suggestion from potential adopters

- Concurrent development with potential customers in China
- Provide the applications examples and business case.
- Set up demo system firstly in some industry.
- Initial investment and cost would be the obstacles for RFID development, how to reduce
- Cost in the application could be a focus.
A demo for supply chain management

Shipping → Receiving → Retail → Smart Shelf
Industry (Tags)

- Chip design
  - HF: Non EPC products
  - UHF: R&D, first prototype released

- Chip manufacturing
  - Enough wafer capability

- Packaging
  - Very limited, no volume production

- Tag converting
  - Printing companies
Industry (Systems)

- Reader
  - HF: mature products
  - UHF: started, no EPC product

- Software
  - Just started application software

- System integration
  - Experienced in ERP
  - Experienced in smart card application
  - Non-EPC RFID system just started
Industry

• Local RFID industry in China is very weak
• The environment for RFID food chain is good
• Big opportunities for tag, reader and system integration
  ➢ Tag: low cost is the key issue for tags and China is the best for cost reduction
  ➢ Reader: very similar to mobile phone, and China is the biggest mobile phone producer
  ➢ System integration: RFID system start from manufacture and China is one of the world manufacture center.
Standard

- No standard right now
- Ministry for Information Industry (MII) and Standard Administration of China (SAC) are setting up a committee specially for RFID

Frequency
- **HF**: 13.553MHz~13.567MHz
  - OK to use
- **UHF**: close to 915MHz
  - Occupied by wireless communication
- **MW**: 2.4 GHz ~2.4835GHz
  - OK to use
- **MW**: 5.725GHz~5.850GHz
  - OK to use
Standard

- UHF frequency allocation for RFID is the most urgent
  - A possible UHF band for RFID is being tested by SRRC
  - Some temporary site licenses may be issued soon
- Standard strategy for RFID is the most important
  - Communication protocol
  - Coding
  - Application
  - EPCIS
AUTO-ID Labs

- Established in Oct. of 1999;
- A group of research institute;
- Focus in research work related in automatic identification and EPC system;
- Cooperate with industry
- R&D on system and tools for RFID
- Promote EPC network
Lab Location

MIT (USA)  Cambridge (UK)  Fudan (China)

St. Galen (Swiss land)  Keio (Japan)  Adelaide (Australia)
Auto-ID Labs at Fudan

- Research on RFID core technology
  - Hardware: tags and readers
  - Software: EPCIS, middleware
  - Network: framework, security
- RFID standard for China
  - Technical reference
- Promote RFID industry
  - Chips, packaging, printing, readers, software, system integration
- Promote RFID application in China
  - RFID demo system and solution
- RFID system education
  - RFID, EPC courses
RFID Tag Chip Design

- EPC Gen2 chip design
- Schottky diode in standard CMOS technology
- Super low voltage low power logic design technologies
- Low power design using asynchronous circuits
- Adiabatic circuit design
- UHF rectifier and charge pump
RFID Tag Antenna

- Matching of antenna and chip
- Antenna on chip
- Wideband antenna
  - Antenna for Chinese UHF frequency
- Fractional antenna
- Antenna on conducting surface
RFID Reader

- RFID system model and performance optimization
- Multi-protocol reader using SDR architecture
- Integrated RF chip for readers
- Reader SOC
- EMI analysis and improvement of readers
Summary

- RFID application is blooming in China
- Chinese enterprises is positive on adoption of RFID technology in both manufacturer and retailer
- RFID food chain is very weak but has a great potential
- RFID standard strategy is very important for the adoption and UHF frequency allocation is the most urgent
- Auto-ID Lab at Fudan University is working on chip technology and RFID application in China