



# 2007-2008 R&D PROJECTS

**Project Reference** ITP/017/07LP

**Project Title** Study the Design Challenges of 90nm Technology UHF RFID Tag IC

**R&D Organisation** The Chinese University of Hong Kong

## Abstract

It is generally believed that for RFID to get wide acceptance in the marketplace the cost must go down to a level of 5 cents per RFID tag or lower. This severely limits the die size of a tag IC and thus only very basic functions can be realized in the tag IC. However, newer generations of fabrication technologies with sub-100nm feature sizes bring new opportunities for the tag IC as more functions can be implemented within the same size. In this project, the development of the tag IC in 90nm technology will be explored.

**Project Coordinator** Prof Chiu-sing Choy

**Project Reference** ITP/018/07LP

**Project Title** An eLogistics Appliance with Data Exchange and Conversion Technologies for Infrastructure Connectivity

**R&D Organisation** The University of Hong Kong

## Abstract

With Internet technology leveling the playing field, small companies and mega enterprises leverage their comparative advantages to deliver goods and services to customers around the world. In a favourable position to climb further up the value chain, Hong Kong has developed and adopted global infrastructures to facilitate information flow of the supply chain. However, it has remained a challenge to many, especially the small and medium enterprises, to connect to these e-infrastructures like the Digital Trade and Transport Network (DTTN) due to their technical and financial capabilities. The proposed eLogistics Appliance enables enterprises in Hong Kong to connect to DTTN and other logistics players. The Appliance will be developed through enhancement of CECID's B2B Connector technology, which provides reliable and secure exchange of any electronic documents on the Internet to achieve supply chain integration between enterprises. In this project, a DTTN Appliance will be developed as a special version of the proposed appliance.

Several Hong Kong leading logistics and IT firms will support this project as pilot partners. They will use our technology to connect to the DTTN platform and other trading partners to conduct various supply chain activities.

**Project Coordinator** Prof David WL Cheung



# 2007-2008 R&D PROJECTS

**Project Reference** ITP/022/07LP

**Project Title** **RFID Benchmarking: Methodology and Practice**

**R&D Organisation** The Hong Kong University of Science and Technology

## Abstract

RFID (Radio Frequency Identification) is an important enabling technology for logistics and supply chain management systems. The amount RFID devices will continue to leap in coming years. It was predicted that China will need at least 4.5 billions RFID devices in 2008 and 5.5 billions in 2010. At present, there are well over 100 RFID vendors and enterprises in China. The performances of different RFID brands and models, however, can vary significantly. A scientific classification and evaluation of their performances is critical to effective RFID deployment. Addressing the need, the objective of this project is to develop a sound RFID benchmarking methodology leveraging established research results in testing, machine learning and communications theory. In fact, RFID benchmarking has been identified a key technological area in the recent 863 initiative by our mainland officials. With our technological excellence in RFID, we have been invited to jointly contribute to the development of RFID benchmarking by the Institute of Automation (CASIA), which was recently awarded a major 863 project on RFID benchmarking and testing. We will also develop the benchmarking methodology in collaboration with other key mainland RFID organisations, which include RFID China Alliance, GuangDong RFID Technology Support Center and Bureau of Quality and Technology Supervision of DongGuan. This project has won the strong support from multiple Hong Kong enterprises, which include Convergence Systems Limited (Chung Nam Group), Pacific Mobile Limited, Million-Tech Development Limited, Computime Limited, Schmidt Electronic Group Limited, Techtronic Industries Company Limited and Eternal Technologies Limited. With CASIA and several key RFID mainland organizations, we shall establish an RFID benchmarking test consortium to market and license the developed benchmarking methodology to mainland RFID vendors and users.

**Project Coordinator** Prof Shing-chi Cheung

**Project Reference** ITP/023/07LP

**Project Title** **RFID Enabling Technologies for Retail & Logistics Industry**

**R&D Organisation** The University of Hong Kong

## Abstract

RFID technology is widely used in logistics industry. To achieve total supply chain visibility and efficiency, the retail industry needs to deploy RFID technology effectively. In retail and logistics environment, it is very likely that multiple RFID applications will be housed under the same roof. While people are focusing on single-purpose solutions, effective software integration technologies that facilitate deployment of multiple RF technologies under the same environment need to be addressed.

The RFID Enabling Technologies for Retail & Logistics Industry is a software platform that includes: 1) Environmental Configuration Modeler that describes the relationships among multiple RFID hardware infrastructures for RFID applications; and 2) Environmental Configuration Manager that orchestrates the RFID hardware devices based on the prescribed relationships at runtime.

The project will effectively promote the wide adoption of RFID technologies in Retail and Logistics industry in both Hong Kong and Pearl River Delta region through the following ways:

1. Provision of a ready-to-use Software Platform that facilitates deployment of RFID application with multiple RF technologies in single premise;
2. Provision of Retail & Logistics application prototypes, such as backroom management, smart shelf, point-of-sales for easy adoption;
3. Provision of multiple RFID applications showcases through pilot implementation.

**Project Coordinator** Mr Edward Wong



# 2007-2008 R&D PROJECTS

**Project Reference** ITP/024/07LP

**Project Title** **RFID-based Interoperable Gateway for Logistics Service Platforms (RIG)**

**R&D Organisation** Hong Kong R&D Centre for Logistics and Supply Chain Management Enabling Technologies Limited

## Abstract

It is generally recognised that the potential benefits of achieving superior supply chain efficiency through RFID networks is tremendous. In China, especially in Beijing, Shanghai, Guangdong and Hong Kong, many RFID service platforms are deployed to provide RFID enabled supply chain network services. Currently, it lacks interconnections among these service platforms. It causes barrier for business collaborations across service platforms in different geographical regions. As the number of service platforms grows, there is a need for cross platform information exchange and sharing for business collaboration, necessitating the needs for interconnecting these disjointed platforms.

The aim of this project is to fulfil the needs from industry. It addresses the challenge by developing an RFID enabled interconnecting technology -- RFID-based Interoperable Gateway for Logistics Service Platforms (RIG). Innovation of our RIG is in its capability to provide analysis on data association and information sharing continuity to derive information mappings for cross platform information interoperability. The RIG will provide a practical solution to contribute to solving supply chain management problems.

**Project Coordinator** Dr Frank Tong

**Project Reference** ITP/027/07LP

**Project Title** **Integrated Passive UHF RFID Tags and Readers**

**R&D Organisation** The Hong Kong University of Science and Technology

## Abstract

The first objective of this project is to develop and demonstrate complete single-chip passive UHF RFID readers and tags by integrating all the enabling technologies developed in the foundation ITF project under the Guangdong - Hong Kong Technology Cooperation Funding Scheme (GHS/086/04). The second objective is to further develop enabling technologies for the next generation of RFID tags and readers with advanced features according to the Electronic Product Codes (EPC) Generation 2 (G2) standards. For the RFID tags, focus will be on lower cost, smaller chip area, higher efficiency and thus longer communication distance, higher data rate, insensitivity to backing materials, rewritable memory, and embedded temperature sensor. For the RFID readers, both the transceiver and the baseband will be fully integrated for a system-on-chip for low power and small chip area and low cost, meanwhile, short-distance wireless capacity (Bluetooth and WLAN) will also be included.

**Project Coordinator** Prof Howard Luong



# 2007-2008 R&D PROJECTS

**Project Reference** ITP/028/07LP

**Project Title** Privacy Protection and Communication Security in RFID Systems

**R&D Organisation** Hong Kong R&D Centre for Logistics and Supply Chain Management Enabling Technologies Limited

## Abstract

Widely regarded as one of the most influential technologies in the 21st century, RFID has inspired a new wave of technology development that spans from silicon circuits to product packaging, from item level identification to supply chain automation. However, as the new technology prevails into people's daily life, serious concerns regarding privacy protection and data security are beginning to rise up. These concerns have become the major barrier that hinders RFID's further deployment.

Current RFID standards, e.g., ISO 18000-6B/C (UHF) or ISO 15693 (HF) use open communication channels, where data exchanged between readers and tags can be easily intercepted by unauthorized parties. The enlarged communication range enabled by UHF Gen2 (18000-6C) standard, poses a potential threat to people's privacy because personal data can be read out at a distance without being noticed. Furthermore, when RFID tags are embedded into the consumer products, consumers either do not have the access to disable the tag's functionality (need authorisation from a reader) or have no easy ways to destroy the tags physically without damaging the product itself, thus privacy and personal information are always at risk.

The recently approved regulation on Chinese RFID frequency band allocation (May 2007) will facilitate the deployment of RFID technology, and create great opportunities for both domestic and foreign vendors. The Chinese regulation exhibits significant differences comparing with its counterparts by FCC (North America), ETSI (Europe) or even Hong Kong SAR. These differences will have significant impact not only on RFID tag and reader hardware designs (IC and systems), but also on security and privacy applications in the Chinese market as well.

The research scope of RFID privacy and communication security will focus on a wide range of technologies that include IC design, encryption algorithms, antenna design as well as material engineering and product packaging. As a starting stage, this seed project will explore and identify the potential enabling technologies in 1) A protocol with data encryption mechanism to ensure communication security 2) A protocol to enable the adjustable reader-tag communication range to ensure communication within authorized proximity, and 3) A tag design with self-destruction mechanism to ensure RFID tags can be disabled permanently at consumer's discretion. Furthermore, this seed funding project will help to expand and broaden the research scope of LSCM centre for future R/D activities, and define and deliver a long-term research project on RFID privacy and data security issues.

**Project Coordinator** Dr Terry Ye

**Project Reference** ITP/036/07LP

**Project Title** A Market Intelligence Study on Enabling Technologies for Industries related to Logistics & Supply Chain Management

**R&D Organisation** Hong Kong R&D Centre for Logistics and Supply Chain Management Enabling Technologies Limited

## Abstract

One of the challenges to Hong Kong logistics and supply chain community is an immense rise in demand as well as competition amid rapid growth in China and expansion of other logistics ports in the region. Logistics and supply chain community including service providers, industry users, technology vendors and researchers is prompted to technology advancement for an enhancement in capability and efficiency in supply chain management. SMEs in Hong Kong due to resources constraint have difficulty in equipping themselves and many will count on the government to help them stand up to the challenge.

Technology advancement can provide a leap to efficiency but 'relevancy' is the key to all developments. This Project on Market Intelligence is to empower logistics and supply chain community with industry needs and technology capabilities to enhance production and adoption of relevant technologies in the industry. The project will also facilitate LSCM Centre in the formulation and implementation of technology roadmap with an aim to strive logistics and supply chain technology development in a demand-led market-driven direction.

The Project is going to leverage LSCM R&D Centre's industry program and strategic partners' network to maximize the coverage. Project results will be disseminated broadly among the stakeholders hoping to create a momentum in the logistics and supply chain community where technology demand will derive supply and technology supply will answer to the call of demand.

**Project Coordinator** Mr Anthony Kwok



## 2007-2008 研发项目

项目编号 ITP/017/07LP

项目名称 **90nm 工艺 UHF RFID 标签 IC 之设计研究**

研发单位 香港中文大学

### 项目简介

一般人相信，当 RFID 的价钱低于5仙就能拥有合理的市场地位。低成本价限制了标签 IC 芯片的面积，继而局限了卷标 IC 的功能。然而新一代芯片研制工艺能生产少于 100nm 大小的晶体管。所以在同一芯片面积下能拥有更多功能。在这个研究项目，将会研究及发展 90nm 工艺标签 IC。

项目统筹人 蔡潮盛教授

项目编号 ITP/018/07LP

项目名称 **电子物流设备 - 连接电子物流基础建设的数据转换及交换技术**

研发单位 香港大学

### 项目简介

互联网技术提供了一个世界平台，让大小企业运用各自的比较优势，合作提供产品和服务。香港能够在全球价值链上占一个有利位置，有赖于拥有先进的供应链管理资讯设施。但是要连接到如数码贸易运输网络(DTTN)的资讯设施，却须投资相当的技术和金钱资源，令中小企不胜负担。这项目建议开发一种名为「电子物流设备」的技术，让企业很容易地连接到 DTTN 和其他物流公司。「电子物流设备」将会利用 CECID 的 B2B Connector 设备作为核心技术。数间领先的物流和软件公司已承诺提供资助及支持，有意应用「电子物流设备」于供应链管理业务上。

项目统筹人 张伟萃教授



# 2007-2008 研发项目

项目编号 ITP/022/07LP

项目名称 **无线射频识别基准测试的关键技术之方法及应用**  
研发单位 香港科技大学

## 项目简介

无线射频识别(RFID)是一项有助于提高后勤和供应链系统管理水平的重要技术。由于新的 RFID 组件将不断投入市场，中国对 RFID 组件的需求将由2008年至少45亿个增至2010年55亿个。目前，在中国有远远超过100家RFID厂商和企业。但是不同品牌和形号的 RFID 组件有着显著的差异。因此，对 RFID 组件进行科学的分类和评估对有效 RFID组件的部署是一项关键的任务，否则，将很大程度上出现错误。基准测试是针对这个问题的一个有效解决方案，我们计划发展一套实在的 RFID 基准测试方法并运用从组合测试、机器学习和无线射频建模的科研成果。无线射频识别基准测试已被国内官方确认为近期国家863重点发展技术。中国科学院自动化研究所为这项技术的领导单位及先驱者；更负责863重点项目之研发 RFID 基准测试的方法。有鉴于我们在 RFID 基准测试这技术之认识及科研成果，香港科技大学已获中国科学院自动化研究所邀请，共同参与研发一套具权威性的 RFID 基准测试方法。我们这项目亦已获得国内 RFID 重点单位，包括中国 RFID 产业联盟、广东省RFID公共技术支持中心、及广东省东莞市质量技术监督局之积极支持和参与。本项目之科研成果会被这联盟采用。本项目亦得到多间香港机构及企业之积极支持和参与。这些单位包括 Convergence System Limited(中南企业成员)、Pacific Mobile Limited、万碧发展有限公司、兴华电子集团有限公司、金宝通集团有限公司、创科实业有限公司及创皓科技有限公司。中国科学院自动化研究所、香港科技大学及其它 RFID 有关之机构将会成立 RFID 基准测试联盟来销售和许可这套发展出来的 RFID 基准测试方法给国内 RFID 厂商和用户。

项目统筹人 张成志教授

项目编号 ITP/023/07LP

项目名称 **支持零售及物流应用射频识别技术之软件平台**  
研发单位 香港大学

## 项目简介

无线射频识别(RFID)技术已经被广泛用于物流行业。零售行业若能善用RFID技术定能提高供应链的可见度及效率。于零售及物流行业中，很有可能有多种无线射频的应用共存于同一环境中。当前，人们只专注于单一应用的解决方案时，如何快速地将多种无线射频识别系统应用集成于同一环境中的技术更需要被关注。

「支持零售及物流应用射频识别技术之软件平台」这套软件平台包括：环境配置模型，它描述多个无线射频硬件基础设施于无线射频应用系统的关系；环境配置管理，它根据预定的关系模型，协调多个无线射频设备的运作。

该项目将通过下列方法有效地促进 RFID 技术在香港和珠三角地区零售及物流行业的广泛应用：

- 1 提供一套可立即使用的快速整合无线射频应用及多种无线射频硬件基础设施的软件平台
- 2 提供各种零售及物流应用原型，例如仓库处理、智能货架及销售系统，简化 RFID 技术的应用
- 3 在试点项目中演示多种 RFID 应用

项目统筹人 黄础章先生



# 2007-2008 研发项目

项目编号 ITP/024/07LP

项目名称 用于物流服务平台互联互通射频识别交换闸(RIG)

研发单位 香港物流及供应链管理应用技术研发中心技术

## 项目简介

人们逐渐认识到采用 RFID 网络技术对提高供应链效率的巨大作用。企业实施 RFID 服务平台的需求正日益增加。在中国，特别是北京，上海、广东和香港地区，正在部署以及构建大量的 RFID 服务平台以提供 RFID 供应链网络服务。这些服务平台的数量在急速增加，导致了基于跨越平台的资讯交换和共享的商务合作的需求。这些服务平台互联互通就显得尤其重要。

本建议专案采用基于 RFID 的互联互通技术--用于物流服务平台互联互通射频识别交换闸(RIG)--来解决这个挑战。RIG 的创新体现于其采用数据关联和信息共享连续性分析的方式实现信息影射，以达到跨平台信息追踪的目的。RIG 将提供一个实用的解决方案连接各种 RFID 服务平台，解决供应链管理中的各种实际问题。

项目统筹人 唐志鸿博士

项目编号 ITP/027/07LP

项目名称 集成无源UHF射频识别读取器和卷标

研发单位 香港科技大学

## 项目简介

本项目的首要目标是开发和演示完整的单片无源 UHF 射频识别读取器和卷标。该芯片的设计将集成多项由ITF项目下粤港科技合作基金(GHS/086/04)支持开发的新技术。另一个重要目标是继续开发具备更多特性的下一代射频识别读取器和卷标技术。卷标的核心技术研发将集中在降低成本、缩小芯片面积、提高效率(更远的传输距离、更高的数据率、和更好的抗干扰能力)、可擦写式存储器以及嵌入式温度感应器。在读取器方面，收发机和基带处理将使用 SOC 技术集成在一个芯片上，以此来获得较低的功耗、更小的芯片面积和更低的成本，并将同时嵌入短距离无线传输能力(例如：蓝牙技术和无线局域网技术)。

项目统筹人 梁锦和教授



# 2007-2008 研发项目

项目编号 ITP/028/07LP

项目名称 **RFID系统的通讯安全和私人信息保护**

研发单位 香港物流及供应链管理应用技术研发中心

## 项目简介

RFID 技术被广泛的公认为是21世纪最有影响力的技术之一。RFID 技术已经激发起了新一轮的技术发展与革新。RFID 所涉及的技术涵盖广泛,从芯片技术到产品包装,从单一物品识别到供应链自动化。随着 RFID 技术越来越深入人们的生活,人们也越来越担心 RFID 所带来的安全与隐私保护的问题。实际上,RFID 安全与隐私保护已经成为 RFID 未来发展的巨大障碍。

现有的标准,如ISO18000-6C(UHF)和ISO15693(HF),都利用开放的通讯信道。读写器和标签之间传递的信息会很容易被人截获。新的 UHF-Gen2 标准加大了 RFID 的通讯距离。同时也加大了个人隐私被窃听的危险性。此外,当 RFID 标签嵌入消费产品,消费者要么没有能力禁用标签的功能(需要授权的读卡机),或者没有简易方式在不破坏产品本身的条件下破坏标签,因此,隐私权和个人信息始终处于危险之中。

最近批准的中国RFID的频段分配(2007年5月),将有助于 RFID 技术的部署,并为国内外厂商创造巨大的商机。中国的RFID标准,相较于对应的美国 FCC(北美),ETSI(欧洲),甚至是香港特区的标准,有明显的差别。这些分歧,不仅对射频标签与读写器的硬件设计(集成电路与系统),而且对 RFID 在中国市场的安全和保密的应用,将产生重大影响。

RFID 的隐私和通信安全的研究范围将会涵盖一系列的技术,包括集成电路设计,加密算法,天线设计以及材料工程和产品包装。在起步阶段,这个提案将探讨并确定如下潜在的技术,1) 数据加密机制,以确保通信安全,2) 可调读写器和标签通讯范围,以确保通信授权,3) 标签设计与自我毁灭的机制,以确保标签可以永久自毁。此外,这个资金项目将有助于扩大和拓宽 LSCM 中心未来研发活动的研究范围,并确定在隐私和数据安全问题方面长期的研究方向。

项目统筹人 叶涛博士

项目编号 ITP/036/07LP

项目名称 **物流及供应链管理相关行业应用技术的市场情报资讯研究**

研发单位 香港物流及供应链管理应用技术研发中心

## 项目简介

香港物流及供应链团队面对的其中一项挑战是在中国的迅速发展以及邻近地区港口数量的增长下所日益增加的需求及竞争。物流及供应链团队包括服务供应商、行业用户、技术供应商及研究员正从技术方面着手以提升供应链管理的技能和效率。由于本身资源所限,大多数香港的中小企将依靠政府的帮助以迎接这些挑战。

科技发展能令效率得以跃进,但最重要的是要发展有实在用途的技术。此项市场情报资讯研究,目的是透过了解行业的需求和技术能力,从而为物流及供应链团队提升生产力及采纳相关之技术。除此之外,此项目亦将促进香港物流及供应链管理应用技术研发中心规划和履行其技术大纲,加以配合中小企的需求,使物流及供应链技术发展能朝着以市场主导的方向进发。

此项目将会利用香港物流及供应链管理应用技术研发中心的业界参与方案及策略性伙伴之网络去增强覆盖范围。而项目成果将会广泛地发表予相关业界人士,期待于物流及供应链团队之间开创一股动力,达致需求导出供应以至供应能解决实在需求的局面。

项目统筹人 郭子正先生