The BRIDGE project
in more detail

BUILDING **R**ADIO FREQUENCY
IDENTIFICATION SOLUTIONS
FOR THE **G**LOBAL **E**NVIRONMENT

BRIDGE Project – Work Plan summary

The implementation of RFID and EPCglobal standard solutions is hindered by a number of technical, social and educational constraints. The objective of the BRIDGE project is to research, develop and implement tools to enable the deployment of EPCglobal applications in Europe.

The following summarises the barriers that need to be overcome to enable the vision to become a reality:

Network

Simple and cost-effective software tools targeted at SMEs
Serial-level lookup service to enable unique item level product information storage and retrieval
Identification and authentication of tags and readers
Data management of extremely large amounts of real-time data

Application Software

Serial-level inventory management
Management of large networks of EPC readers
Models to exploit environmental data (temperature, humidity, etc)

Security

Security for privacy and to prevent illicit use of EPC
Prevention of cloning & emulation of tags in EPC
Secure transmission of data between readers and tags

Hardware

High performance readers for the European requirements
Low-cost and scalable tag disabling technology
Low cost sensors (temperature, humidity) linked to EPC tags

Implementation

Impact on information systems design and functionality
Pilot projects demonstrating the effective benefits of the technology
Social implications of RFID network

Europe

Increase the influence of European organisations in global standard processes
Address through relevant research the barriers to successful implementations of the EPC technology in Europe
Practical application guidelines and adoption tools enabling the roll-out of the technology in Europe

SCOPE	By and large, RFID technology is ready for deployment. As a matter of fact, this is one of the drivers behind the BRIDGE project, which aims to catalyse the massive adoption of this new technology by European industry. However, there is still a lot of room for further research and development in this technology in many areas, which can be summarised in three key objectives: • To make RFID more secure • To make RFID more adaptable • To make RFID more affordable
WORK PROGRAMME	Task 1.1 Sensor-enabled tags - To define a common tag hardware platform that separates the tag RF communications, the data capturing, the data processing, and the power subsystem Task 1.2 Miniature tags - This task aims to advance the research, and to apply the results to the design, fabrication, and testing of a small tag, as close as possible to 1x1 cm, suitable for use on articles such as medicine phials. Task 1.3 Metal and dielectric object tags - To design a reasonable-cost RFID tag for metal objects. Task 1.4 Low-cost readers - The goal is to decrease the hardware costs to one order of magnitude, obtaining in few years RFID readers in the €100 to €300 range. Task 1.5 High read-rate antennas for readers - The goal of this task is to research the best antenna designs and configurations to obtain read rates as high as possible. Task 1.6 Ambient-intelligent RFID systems - The goal of this task is to select some specific cases in which the smart object model adds most value, and to develop a fully functional prototype.
PARTICIPANTS	UPC, CAEN, UPM Raflatac, Confidex, Auto-ID Labs Fudan, Auto-ID Labs Cambridge, Cetecom and AIDA.

SCOPE	The object of this WP is to investigate the different possibilities for creating, addressing and maintaining the large heterogeneous network of ICT resources to hold the information about the physical objects (items).
WORK PROGRAMME	Task 2.1 Requirement analysis for serial-level lookup service - A common set of requirements that is applicable across most industries will be obtained after researching the different possible approaches. Task 2.2 Requirement for integration with existing business information systems - Serial-level lookup services will most likely be used in conjunction with other business information systems and therefore compatibility issues need to be examined. Task 2.3 Prototype development - The development of a serial-level lookup service prototype will include an investigation to define a proper secure standard interface to enable application software to make use of the link data held in the lookup service. Task 2.4 Migration and Adoption tools - This task involves developing guidelines for migration from existing business information system to those that include serial-level master data and lifecycle event information.
PARTICIPANTS	Cetecom, Auto-ID Labs Cambridge, ETH, BT, SAP, AIDA and GS1 UK.

SCOPE	The main aim of this work package is to encapsulate information from the EPC Network, analyse the information and utilise it to enhance existing supply chain business processes and/or decision-making processes.
WORK PROGRAMME	Task 3.1 Serial-Level Inventory Tracking - This task will develop track and trace models based on information derived from Serial-Level Lookup Service (WP2). Task 3.2 Serial-Level Inventory Control - This task will develop basic inventory control models for store reordering using serialised item level information. This is particular important for SMEs to demonstrate the benefit of networked RFID. Task 3.3 Serial-Level Manufacturing Control - This task will integrate serial level item information with existing production planning and control, and investigate ways in which manufacturing decisions could be improved. Task 3.4 Reusable Asset Management - This task will develop contextual models for reusable asset management. Reusable containers, pallets, roll cages etc. could be tagged and tracked in order to improve operational efficiency. Task 3.5 Serial-Level Reconciliation - This task will provide a list of audits, checks and exception scenarios and develop recommendations for the reconciliation of serialised item level information with Advanced Shipment Notices, payment processes, pedigree etc. Task 3.6 Serial-Level Condition Monitoring - This task will develop contextual models to predict the condition of each product using sensory information such as temperature, pressure, humidity and shock – information from this contextual model will be used to enhance inventory control.
PARTICIPANTS	Auto-ID Labs Cambridge, ETH, BT, SAP, Bénédicta.

SCOPE	The objective of this work package is to ensure that RFID tags, readers, network infrastructure and RFID services are developed in harmony with security features to enable effective and safe deployment of applications in various business sectors and to ensure that security and privacy of the end-user is not compromised.
WORK PROGRAMME	**Task 4.1 Security Analysis and Requirements** - The aim of this task is to focus on business and social issues that could derive from an uncontrolled deployment of RFID tags in particular for item level tracking, consumer applications and the complex sharing and transferral of assets and tags. **Task 4.2 RFID Tag Security** - This work packages will study the security and privacy issues, including the risks and threats, that could affect the deployment of new RFID standards. It will be run in collaboration with the hardware WP1. **Task 4.3 Anti-cloning RFID Tag** - This task will develop techniques that improve the resistance to simple cloning attacks. It will focus on solutions that meet both business and standard requirements. **Task 4.4 RFID Trusted Network** - This task will examine how the inclusion of trusted computing modules in RFID readers can be exploited to improve security. **Task 4.5 Network Confidentiality** - This task will look at collaborative and federated supply chain environments and the requirements to restrict the visibility of business events carried within RFID networks. It will define solutions to protect the confidentiality of information in the network and to control the dissemination to other members of the network. **Task 4.6 Supply Chain Integrity** - This task will look at security mechanisms within the EPC Network such as RBAC (Role Based Access Control), logging mechanisms and automated auditing. These mechanisms should deter and increase the cost and difficulty of attempting these illicit practices. **Task 4.7 Roadmap, Dissemination and Interoperability** - This task will look at the opportunity to disseminate our work and trial experience through security conferences and appropriate working groups.
PARTICIPANTS	BT, Bénédicta, ETH, SAP, TUG, UPC, CETECOM, Auto-ID Labs Fudan, GS1 UK, UPM Raflatac, Confidex and CAEN.

SCOPE	The focus of this work package is on using EPC technology to increase the protection against illicit trading. It will facilitate a general adoption of the EPCglobal technology to prevent counterfeiting and illicit trade.
WORK PROGRAMME	**Task 5.1 Problem Analysis** - This task will investigate the drivers and enablers of counterfeiting and product piracy, and analyses the supply and demand side of illicit trade where EPC could have a constructive effect. **Task 5.2 Requirements Analysis** - This task focuses on the analysis of the impact of counterfeiting and illicit trade on the end-user and the consumer, as well as the requirements of brand-owners and manufacturers. **Task 5.3 Business case** - This task focuses on assessing the economic justification of pursuing the implementation of RFID/EPC technology as an anti-counterfeiting solution. **Task 5.4 Development of Trial Infrastructure** - This task focuses on preparing the trial infrastructure prior to the trial phase: selection of appropriate transponders, integration of tags in selected products, identification of any necessary adjustments in the manufacturing process and finally system integration. **Task 5.5 Evaluation** - Will assess the level of security achieved, the user-friendliness of the proposed solution, the fixed and variable implementation cost, the cost per product authentication once the solution is applied and possible side effects. **Task 5.6 Application Guidelines** - These guidelines not only reflect technical issues, but also cover organisational changes and marketing and public communication advice, which are essential when dealing with critical issues such as counterfeiting. **Task 5.7 Implementation Roadmap** - The Implementation Roadmap will be based on the expertise acquired during the project and especially reflect the lessons learned from within the Pilots and Development tasks. It will facilitate a general adoption of the EPCglobal technology to prevent counterfeiting and illicit trade.
PARTICIPANTS	SAP and ETH.

SCOPE	This work package aims to implement a track and trace solution to increase patient safety in the branded and generic pharmaceutical supply chain for all types of pharmaceutical products.
WORK PROGRAMME	Task 6.1 Problem Analysis - This task will explore the vision of a "safety chain" in the pharmaceutical supply chain, where: transparency and common standards across Europe are the key; one architecture will underpin the new system. Task 6.2 Requirements Analysis - This task will identify and document a set of requirements that identifies the tools, standards and policies that need to be addressed in order to meet the aim of this Work Package. Task 6.3 Business Case - This task will account for the likely costs of implementation for a track and trace system, the perceived requirements for process change within and without the organisation using the pharmaceuticals and aim to identify the likely culture and business practice implications. Task 6.4 Development for Pilot Preparation - This task will include the plan for the design, build and deployment for the pilot system in the required timescales. Task 6.5 Pilot Implementation and Deployment - The objective of this task is to develop a pilot from implementation to achieved results. Task 6.6 Pilot Evaluation - This task will evaluate the results of the Pilot: The functional performance of the hardware and software, the ability of the system to meet the needs of 'high speed' production of medicines, the quality and consistency of supply chain traceability, the impact on people and functional processes for each participant, the impact of cultural and business practice issues, the costs and benefits perceived for each participant organisation. Task 6.7 Pilot Experience Dissemination - This task will focus on the preparation and development of tools to enable the successful dissemination of pilot results and experiences ('lessons learned') to the widest possible audience and the further implementation of the processes themselves.
PARTICIPANTS	JJ Associates, GS1 UK, Verisign UK, Melior, Unisys, Domino.

SCOPE	The objective of this work package is to prepare the adoption of the RFID/EPC technology in the European textile Industry in the best possible way. This objective will be achieved by detailed empirical and analytical analysis at all levels of the textile chain. A best practice orientated and scientific based path will be initiated to align the requirements and the expectations of the textile industry with the technical opportunities.
WORK PROGRAMME	**Task 7.1 Problem Analysis** - It is the goal of this task to do the primary (based on documentation) and secondary (based on direct interviews) research that provides a clear picture of the problems and opportunities specific to the European textile sector. **Task 7.2 Requirements Analysis** -The business challenge will be converted into the specifications of the RFID/EPC deployment for the textile industry. Besides seeking improvements of the "as is" value chain, this task will also be forward looking and outline the new business processes defined around the concept of intelligent products. This will create sustainable business advantages for the European industry. **Task 7.3 Business case** - An economic measure of the improvements will be performed. It will analyse savings in material or labour costs, reductions in lead times and opportunities for opening new markets or obtaining breakthrough competitive advantages. Finally, some improvements may affect the company intangible assets such as its brand name. **Task 7.4 Empirical Study** - The empirical approach starts with an empirical study including Tasks 1 to 3. It runs simultaneously to the tasks in the analytical approach and delivers users requirements of the textile sector. **Task 7.5 Industry trial preparation report** - The trial will involve a full technical implementation of an RFID-enabled supply chain, including the receiving process of textile in retail warehouse and all consumer oriented processes within the department store.
PARTICIPANTS	GS1 Germany, GS1 Spain, Kaufhof, El Corte Inglés, Carrefour, Gardeur, UPC, AIDA.

SCOPE	This work package will provide a basis for introducing RFID technology within the manufacturing environment to improve production processes.
WORK PROGRAMME	**Task 8.1 Problem Analysis** - The objective of this task is to identify business process improvements that are possible through RFID tagging of Work In Progress (WIP) containers. For timely and accurate container information, RFID could be used to tag these containers to provide automated identification and location determination for the use of quality, hygiene and manufacturing control. **Task 8.2 Requirements Analysis** - A set of hardware and software requirements will emerge that identifies the tools, standards and policies that need to be addressed in order to meet the aim of this work package. **Task 8.3 Business case** - The aim of business case analysis is to determine how the benefits derived from RFID implementation weigh against the costs of implementation. Specifically, it will examine the gains on business and operational activities to be obtained from having WIP container visibility and will compare this against the costs of hardware and software implementations **Task 8.4 Development for Trial Infrastructure** - The aim of this task is to deploy an RFID system that will not only meet the objective but is adaptable and robust for the whole duration of the pilot. **Task 8.5 Presentation of Results** - The results of the analysis and of the trials performed will be comprehensively documented leading to guidelines facilitating the adoption of the RFID/EPC technology in manufacturing processes.
PARTICIPANTS	Nestlé UK, Auto-ID Labs Cambridge, SAP, BT.

SCOPE	The scope of this work package is to improve reusable asset management in supply chains. It covers pallets, crates, barrels, gas cylinders, beer kegs, rail cars, trailers and many others. The goal is to develop a secure track and trace solution that is based on the EPCglobal Network and on emerging ubiquitous computing technologies.
WORK PROGRAMME	**Task 9.1 Problem Analysis** - The problem analysis will be done with all parties involved in reusable asset management, including end users of asset, assets providers, solution providers etc. It will identify key actors involved in the reusable asset market in Europe, evaluate the market size, describe the market practices and analyse the current strengths and weaknesses. **Task 9.2 Requirements Analysis** - This task is about identifying tools, standards, services and policies necessary to solve reusable asset management issues. From a research point of view it will define all technical requirements necessary to provide good solutions to the market. It could cover improvement of current technology or development of new ones. **Task 9.3 Business case** - The objective is to define different ways to solve the business requirements with technology like RFID and the EPC Network. It will include a cost/benefit analysis. The goal is to analyse the impact of potentials solutions in conjunction with market complexity, since technical solutions will not solve all issues. **Task 9.4 Reusable Asset Management Trial** - Several pilots will be done on different part of the solution. RFID and EPC Network will provide a full solution for reusable asset management but it will be possible to exchange information on the network without RFID implementation. **Task 9.5 Evaluation** - The analysis and the trial will be evaluated, presenting the basis for application guidelines aimed to facilitate implementations. **Task 9.6 Dissemination** - Several tools will be delivered: Technical guideline for Reusable Asset Management; Implementation Guideline for Reusable Asset Management; Cost/benefit Analyser software; Training tool kit CD "How to improve Reusable Asset Management". The dissemination of the work to many solution providers will create the context to give an easy access to "ready to use" solutions for SMEs.
PARTICIPANTS	GS1 France, GS1 Germany, Carrefour, Bénédicta.

SCOPE	This Work Package will examine the role of RFID in providing accurate and complete item level information in a timely manner to enhance the management of products in service. The success of this business cluster will provide a strong reference case for Europe on ways to enhance the product service industry.
WORK PROGRAMME	Task 10.1 Problem Analysis - This task will examine business benefits and challenges of effectively applying RFID tags on critical components and/or sub-components of a simple/complex product, and then to associate and use the information pertinent to these components when the product is in the forward, reverse and service/maintenance supply chains. Task 10.2 Requirements Analysis - This task is intended to identify the tools, standards and policies that need to be addressed before actual implementation. The work will be split into three areas: within the manufacturing facility, products in distribution, products in service. Task 10.3 Business case - The aim of business case analysis is to determine how the benefits derived from RFID implementation weigh against the costs of implementation. Task 10.4 Development for Pilot Infrastructure - This task focuses on preparing the pilot infrastructure prior to the pilot phase. It will include design, development, and implementation of hardware (RFID, logistics, etc.) and software (databases, DSS, etc.) as per the Requirements document. Task 10.5 Evaluation - This task will assess the ease of information retrieval and storage using RFID, improvement in maintenance and service management, cost of tagging components and ease of off-site and on-site maintenance. Task 10.6 Application Guidelines - It will ensure that insights from this trial implementation will be documented into guidelines that will facilitate general adoption of networked RFID technology in this sector. This work package will provide a description of expected and actual implementation benefits and challenges. We will also provide recommendations on ways to improve product service using RFID.
PARTICIPANTS	Auto-ID Labs Cambridge, Sony, BT, Carrefour.

SCOPE	The objective of this WP is to understand how item level tagging will help to improve efficiency and provide better services for customers. This includes amongst others: optimise orders and forecasts with enhanced visibility; reduce returns to suppliers; improve the inventory process both at warehouse and store level (speed, accuracy); decrease out of stocks; lower shrinkage; develop collaboration between partners.
WORK PROGRAMME	**Task 11.1 Item tagging at retailer level – cultural products** - The objective of this task is to understand the current business process in cultural products (CD's, DVDs, etc.) at retailer level and to develop a set of new or revised business processes, including RFID. The new business processes will be experimented by installing and testing the required hardware and software. **Task 11.2 Item tagging at both retailer and manufacturer levels – cultural products** - The objective of this task is to understand the current business process in cultural products at both retailer and supplier levels and to develop a set of new or revised business processes leading to improvements in collaboration. The new business processes will be experimented by installing and testing the required hardware and software at both supplier and retailer sites. **Task 11.3 Item tagging at retailer level – textile products** - The objective of this task is similar to task 11.1 but it will be based on textile products. **Task 11.4 Item tagging at both retailer and manufacturer levels – textile products** - Similar to task 11.2, but for textile products. **Task 11.5 Enlarge scope to other non food category** - The new target product range will be determined by a working group. The methodology for implementation is the same as for tasks 1 and 2.
PARTICIPANTS	Carrefour, Auto-ID Labs Cambridge, GS1 France, GS1 Germany.

SCOPE	The objective of this work package is to provide and support a blended learning solution on the standards, combining Information Days (Roadshows), Webinars, e-Learning and other training deliveries based on Training Kits for use by the active and future users of EPC.
WORK PROGRAMME	**Task 12.1 Requirements Analysis** - Under this task, we will prepare and define the different delivery methods and mechanisms to answer the future training needs of a global community of users with a diversity of learning styles. **Task 12.2 Development of Course Materials** - This task aims to develop the pedagogic contents of the 3 courses in English. The information obtained from the Requirements Analysis will be used for the development of: syllabi (student and trainer kits), quizzes (tests and evaluations), slide shows (presentations), case studies (hands-on exercises), readings, assignments and e-learning courses. **Task 12.3 Evaluation and further development of course materials** - Following the pilot, the feedback from the pilot group will be analysed and the final version of the course material will be developed. Following acceptance tests, the final course material will be available for translations. **Task 12.4 Set up & Testing of e-Learning Platform** - In parallel and following sound courseware development methodologies, an eLearning platform will be set up. The parameterisation of the GS1 web based training system LEARN will allow for full student administration, tracking and certification for this project.
PARTICIPANTS	GS1, Auto-ID Labs Cambridge.

SCOPE	This work package will deliver adoption tools that will enable project partners to inform and educate all stakeholders (consumers, industries, SMEs, solution providers, non-profit organizations, etc.), not only on the findings and results of the various business clusters, but also on the impacts and benefits of RFID/EPC in general.
WORK PROGRAMME	Task 13.1 Concept Animations - This task proposes to develop a framework for concept animations and a number of concept animations. The concept animations will be multi-media learning objects (e.g. Macromedia Flash) that can be reused for various purposes (e-learning courses, presentations, etc.). Each animation will clearly illustrate how the use of RFID/EPC technology and the EPC Network, as a result of the research conducted in the other Work Packages, will enable certain applications. Task 13.2 Portable Demo - The objectives of this task are to design a model of the EPCglobal Network and to create a demonstration version of the model, which shows how the EPCglobal Network function will be used under real supply chain conditions. Task 13.3 Economic Impact Toolkit - EPCglobal driven information networks are capable of significantly impacting upon the efficiency, velocity and flexibility of organisations whether commercially focused or not. The purpose of this study is to evaluate the economic and social impacts of different rates of EPCglobal adoption, at different levels of granularity throughout 'old' and 'new' Europe at a macro level. Task 13.4 Set-up/maintenance of project portal/collaborative environment - A publicly accessible website will be created at the beginning of the project to explain the goals, organisations involved and milestones for the project and to disseminate the press releases, reports and results of BRIDGE. Task 13.5 Awareness Toolkit - The members of EPCglobal realise that the introduction of any new technology can raise questions in the minds of all stakeholders, and there are no stakeholders more important than consumers. The role of consumer acceptance of such new technology and appreciation of its benefits in ensuring its success is crucial. Task 13.6 Roadshow - In order to facilitate the adoption of RFID/EPC in the whole of Europe, the findings and deliverables of this project need to be communicated in each of the member countries. As conferences and seminars are currently a very important channel for sharing knowledge and experience, we need to prepare an information package that is specifically targeted at these type of events.
PARTICIPANTS	GS1, GS1 Poland, GS1 China, ETH.

SCOPE	Project Management activities are centralised in this one work package. The management activities of the project are focused on ensuring each partner meets its responsibilities in relation to the project, coordination of activities with regional and national partners, and administrative management related to periodic progress reports and regular meetings with the European Commission.
WORK PROGRAMME	**Task 14.1 Project Administration & Executive Management** - The administrative project management consists of: preparing and circulating the Consortium Agreement in advance of signing the contract with the Commission; preparing and distributing non-technical reports (Management Reports, 6 Monthly Progress Reports); preparing and submitting combined cost statements to the Commission; maintaining regular contact with the Commission and the responsible Project Officer; communicating with other EU funded projects; coordinating dissemination activities and measuring and reporting project progress. **Task 14.2 Technical Project Management** - Each technical and business cluster has a technical manager, who is responsible for technical project management, including co-ordination, monitoring and supervision of overall technical developments, acting as a consultant of the Project Manager and resolution of technical and implementation related problems and conflicts. **Task 14.3 Project progress towards IST-RTD objectives** - A project progress reporting deliverable will report on the 'output' and 'impacts' indicators that will help to assess the progress in 2006-7-8 towards the achievement of the IST-RTD implementation objectives. **Task 14.4 Cluster Co-ordination** - The co-ordination between the pilots and the co-ordination between the technical and the business application work packages will be critical to the success of the project. A specific task is assigned to that purpose.
PARTICIPANTS	GS1 and GS1 UK.

SCOPE	This work Package will develop high-level reports analysing on the one hand the evolution towards the ubiquitous presence of the technology and on the other hand the impact this technology will have on policies that are governed by the European Institutions.
WORK PROGRAMME	**Task 15.1 From RFID to the Internet of things** - As work on the BRIDGE project progresses, the participants will be developing a clearer view of how ubiquitous computing may develop, especially with regard to RFID and its use in supply chains in a more pervasive network. A short research report will be prepared at the end of the first year of the project, a second release at the end of the second year and a fuller White Paper at the end of the BRIDGE project. **Tasks 15.2 RFID and public policy matters** - The BRIDGE project will range from business applications to technical developments and includes a major facilitation activity where training and education modules will be produced and deployed. This will lead to interactions with everything from the citizen as consumer to the company employee as researcher, and impacts a range of public policy matters. The exact nature of these public policy discussions will only become apparent as the project progresses, and the BRIDGE project will wherever it is relevant support the initiatives of the European Commission on RFID.
PARTICIPANTS	GS1 UK, GS1, Auto-ID Labs Cambridge, UPC, Auto-ID Labs Fudan, ETH.

BRIDGE PARTNERS

The partners engaged in the BRIDGE consortium represent a good balance between GS1 organisations, Universities, Users and Solution providers. The partners include large corporations as well as small and medium size companies. GS1 Global Office is the project coordinator.

GS1
Global Office (Coordinator) • France • UK • Germany • Spain • Poland • China
Universities
Cambridge • ETH Zurich • Fudan • UPC Barcelona • TUG Graz
Users
Carrefour • Bénédicta • Kaufhof • Gardeur • Nestlé UK • Sony • El Corte Inglés
Solution Providers
BT • SAP • AIDA • Caen • Confidex • Cetecom • UPM Raflatac • Verisign UK • Melior • Unisys • Domino • JJ Associates

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