

A. Background

1. The **Presidency's Conclusions of the European Council of 14-15 December 2006** states: **“The 2008 Spring European Council will review the challenges of the next generation of Internet and networks within the framework of the Lisbon Strategy”**.
2. In **15th March 2007**, following the results of a Public Consultation and a seminar held in October 2006, the **Commission issued the Communication “Radio Frequency Identification (RFID) in Europe: steps towards a policy framework”**.

In this Communication we can read:

“RFIDs are indeed seen as the gateway to a new phase of development of the Information Society, often referred to as the "internet of things" in which the internet does not only link computers and communications terminals, but potentially any of our daily surrounding objects – be they clothes, consumer goods, etc.”

“RFID is of policy concern because of its potential to become a new motor of growth and jobs, and thus a powerful contributor to the Lisbon Strategy, if the barriers to innovation can be overcome.”

“Although the market for RFID systems in the EU is growing at about 45% a year, it lags behind the almost 60% growth in the global market. Such a "growth gap" will hold back the contribution of the Information Society to growth and jobs.”

Among the actions to be taken at the European level, we find:

“Over the next two years, the Commission will continue to analyse the options to respond to the concerns and to address the issues at stake, taking into account the discussions with the relevant stakeholders.”

“The Commission will continue to closely monitor the move **towards the "Internet of Things"**, of which RFID is expected to be an important element. **At the end of 2008, the Commission will publish a Communication** analysing the nature and the effects of these developments, with particular attention to the issues of privacy, trust and governance. It will assess policy options, including whether it is necessary to propose further legislative steps to both safeguard data protection and privacy and address other public policy objectives.”

The main themes of policy action identified are:

- **Privacy, data protection and security**
- **Research and innovation**
- **Increased Competitiveness and Consumer Protection**
- **Interoperability, standardization and radio spectrum harmonization**
- **Environmental and health issues**
- **Governance of resources in the future "Internet of Things".**

3. In the **7-8 June 2007** session of the **Council –Transports, Telecommunications and Energy, in the Exchange of Views promoted by the DE PRES** Portugal called for the questions regarding R&D and innovation, and the issues of economic competitiveness, standardisation and consumer protection, to be also addressed at the Competitiveness Council. It also called for the need to involve the Justice and Internal Affairs Council to discuss pending and sensitive questions regarding privacy, data protection and security.
4. In **25-26 June 2007**, the German Presidency in collaboration with the Commission organized **in Berlin the Conference “RFID: Towards the internet of things”** where the draft of the publication **“European Policy Outlook RFID”** issued in July, had been present for discussion.
5. In the **28th June 2007**, the **Commission established a “Expert Group on RFID”** to operate between 1st July 2007 and 31st March 2009, having as members representatives of the end-user communities that are subjected to RFID systems (citizens, consumers, patients, employees), of privacy organisations, of users from different application sectors (logistics, automotive, aerospace, health, retail, pharmaceuticals), of industries actively involved in setting up RFID systems (such as RFID chip producers, designers and manufacturers of packaged tags and readers, software and systems integrators, service providers, and privacy and security solution providers), of standardisation bodies.

As observers, this group counts with representatives of Member States assuming Presidency of the EU over the course of the Expert Group term of office and of data protection authorities. Other observers who can be invited to participate are: academic researchers and practitioners; technology experts, in particular with regard to the next generation of networked RFIDs (‘Internet of Things’); legal experts who shall provide advice on existing legislation.

6. In **15-16 November 2007**, the Portuguese Presidency, in collaboration with the Commission, universities and industry, organized **in Lisbon the Conference and Exhibition “On RFID – The Next Step to THE INTERNET OF THINGS”** (<http://www.rfid-outlook.pt/>). The conference counted with the participation of European Industry and civil society organizations, and of researchers from Europe and from outside Europe, in particular some involved in international knowledge networks within partnership programs with Portugal. In

preparation of the conference, an **open call for mobilizing ideas on large scale business and technological pilot trials** was issued for selecting a few cases to be presented at the conference.

B. The potential social contribution of RFID and THE INTERNET OF THINGS

7. The Communication identifies several social contributions of RFID and THE INTERNET OF THINGS:

“RFID has the potential to **benefit people in many ways: safety** (e.g., food traceability, healthcare, anti-counterfeiting of drugs); **convenience** (e.g., shorter queues in supermarkets, more accurate and reliable handling of luggage at airports, automated payment in highway tolls, parking lots, etc.); and **accessibility** (e.g., disabled people).”

“In transport, RFID is expected to contribute to **improved efficiency and security**, and provide new **quality services** for mobility of people and goods. In **healthcare**, RFID has the potential to increase the quality of care and patient safety, and to improve medication compliance and logistics. In **retail**, RFID could help to reduce supply shortages, inventory levels, and theft. In many industries, including pharmaceuticals, medical devices, entertainment, consumer electronics, luxury goods, car parts, or retail, where counterfeiting is a significant source of products of unacceptable quality, the use of RFID may allow products to be recalled more efficiently and to prevent illicit goods from entering the supply chain or spot where these actually entered it. RFID tagging is expected to **improve sorting and recycling of product parts and materials**. This may result in a better protection of the environment and an improvement in sustainable development.”

C. R&D needed for increased competitiveness on RFID and THE INTERNET OF THINGS

8. The Communication identifies several topics of R&D important for RFID and THE INTERNET OF THINGS:

“Main research areas concern **innovative applications, smart sensors and RFID-enabled actuators**, as well as **intelligent networks**. Substantial effort is also spent on **nanoelectronics, which supplies the intelligence, memory, sensing, and Radio Frequency capability to RFID tags**.”

“RFID technology is still an area of active research and development. **Cost reductions of passive tags** to less than 1 cent, needed for mass application, require two complementary avenues of research: **further miniaturisation** of silicon chips through innovations in design and assembly; research on **non-silicon organic materials** that hold the promise to produce printable [low cost] RFID tags. More research is also needed on **security (authentication, encryption)** and larger **rewritable memories**. Future applications will need larger memories, more complex cryptographic engines, **active networking capabilities, integrated sensors and power management techniques**.”

“The 2007-08 work programme of the ICT theme of the 7th Framework Programme (2007-2013) has identified four challenges which mention RFID in a number of situations (**healthcare, intelligent vehicle and mobility systems, micro and nanosystems, organic electronics, and future networks**) as well as the eMobility Platform. In the future, the Commission will stimulate research on security of RFID systems, including light-weight security protocols and advanced key distribution mechanisms, with a view to preventing direct attacks on the tag, the reader and the tag-reader communication. In response to the results of the European consultation, the Commission will also support further development of **privacy-enhancing technologies** as one means to mitigate privacy risks.”

“Since the dynamics of RFID deployment in the various application domains differ significantly and experiences are still scarce, awareness of the expected benefits and possible risks is low, and barriers to a given application domain are high. In Europe, most countries have only limited experience with the implementation of RFID. To improve this situation, there is a **need to carry out in-depth overall evaluations of RFID implementation through large-scale pilots** in specific application domains, taking into account technical, organisational, societal and legal issues, as a prerequisite for widespread take-up and adoption of this technology.”

9. In the area of energy supply and management, new advancements dependent on R&D are needed for integrated, miniaturized energy storage and energy efficiency, and for harvesting energy from the surrounding environment either from the sun, mechanical movement and vibrations, or electromagnetic radiation.

In the area of intelligent networks, significant contributions of R&D are needed for developing the communicating sensor networks with decentralised control and the semantically enriched middleware that are necessary for THE INTERNET OF THINGS and for RFID ubiquity.

D. **Next steps**

10. In view of the developments indicated above, we recognize that:
 - (1) RFID is an important building block for the future INTERNET OF THINGS which in the next two decades is likely to attain numbers of connected appliances and sensors of orders of magnitude estimated, respectively, in tens and hundreds of billions. It is, therefore, a major opportunity for Europe R&D and for Europe ICT industry, as it has the potential to become a boom market in the near future and medium-sized companies are likely to have a good share in this evolving ICT segment.

- (2) To harness the potential contribution of RFID and THE INTERNET OF THINGS to Europe competitiveness, the creation of new ICT jobs and the social benefit of the people, fast action is necessary to assure the conditions for developing a related lead market in the EU, so it is desirable that Member States and the Commission work to shorten the timeline presently planned to develop the necessary R&D, standards and regulatory or legislative measures, in particular in what concerns interoperability, governance, privacy, data protection, security and consumer protection.
- (3) Regarding R&D, it would be desirable that Member States and the Commission open as soon as possible in 2008 new opportunities for furthering research in the areas that were identified, and for the launching of trial pilot-projects to test in real life concepts and techniques, and to identify bottlenecks, including through instruments of the 7th Research Framework Programme, the Competitiveness and Innovation Framework Programme, and procurement for public services.
- (4) The expansion of RFID based applications and THE INTERNET OF THINGS requires large numbers of skilled personnel, in particular engineers, computer scientists and technicians, knowledgeable of RFID, sensor and network technologies, calling for actions adapting occupational training, continuing education, and universities and polytechnics curricula to the associated opportunities and needs.
- (5) Accelerating the process for Europe to take full benefit of the opportunities opened by RFID based applications and THE INTERNET OF THINGS requires effectively addressing at an early stage privacy, data protection, and security concerns in order to assure the confidence of consumers and the industry, and, therefore, it would be desirable to bring as soon as possible these issues to the considerations of the Justice and Internal Affairs Council.