



Reflection Paper of the Federal Government of Germany

From Berlin 2007 to Nice 2008 and Beyond:

“RFID – Internet of Things – Internet of the Future”

Applications based on Radio Frequency Identification (RFID) are the key to the Internet of Things and to an Internet of the future that possesses immense potential for innovation and growth. For this reason, the government of the Federal Republic of Germany wish to press forward jointly with these key technologies in order to enhance the EU’s position as a location for business and technology. In the summer of 2007, under the German EU Presidency, the issues of RFID and the Internet of Things were tackled at a new level of intensity, particularly with respect to the technical and socioeconomic aspects of developing both RFID technology as well as an Internet of Things and services. This intensified discussion among EU Member States – which is being conducted in close interaction with relevant actors in the European Commission as part of an overall approach toward innovation policy – was launched at the conference “RFID: Towards the Internet of Things”, which was held in Berlin in June 2007. Given the competing initiatives in this area throughout the world, it is necessary for concerted action to be taken at the European level. The report “European Policy Outlook RFID” established the basis for this policy agenda. This report was prepared at the time of the Berlin conference with the assistance of an interdisciplinary panel of experts from industry, science and government; with its central focus on three key themes – (a) challenges for market-driven innovations, (b) technology and application roadmaps and (c) societal issues – it remains the benchmark for European policy development in this field.

When assessing the progress that has been achieved since then, it is particularly important to take a closer look at the innovation policy issues that have risen in priority in the meantime. In this sense, it is necessary to analyse both pending and achieved technological advances as well as the governance challenges that arise from the development of an infrastructure for an Internet of Things.

At this point in time, it can already be confirmed that RFID technology, which is an essential – although not the only – technological component for a future Internet of Things, is functioning as a key pace-setter in this field. This fact is reflected in both the accelerating development of technology as well as the roll-outs in industry, particularly in small and medium-sized enterprises.

Nevertheless, we are still only in the early stages of developing an Internet of the future. Along the way, we will have to overcome numerous technological and infrastructural challenges in our efforts to establish new services. The German Federal Government welcomes the initiative of the French EU Presidency to hold a conference “Internet of Things – Internet of the Future” in Nice, which provides the opportunity to lay out the perspectives for an "Internet of the Future" by continuing the discussion process launched in Berlin and by building upon the results of the Lisbon and Bled conferences held during the Portuguese and Slovenian EU Presidencies.

Technological challenges

If the Internet of Things is to be developed into a new paradigm that provides wide-ranging business opportunities for nearly every sector of the European economy, then simple identification technologies (such as passive RFIDs and two-dimensional bar codes) must be complemented with localisation and sensor-actuator functionalities. However, one fundamental aspect of the Internet of Things is currently not being addressed adequately, namely: the “things” can only be integrated into systems by outfitting them with identification characteristics, sensory perception and interfaces for communicating with a network. This requires technical instruments such as active RFID transponders, e-grains or other functional microsystems to serve as integral components of objects. These instruments constitute the “nerve endings” of an Internet of Things and potentially contain actuators, sensors, data and power storage capacity, processing technologies and communication interfaces.

At present, these technical instruments and functionalities are not yet available in sufficient variety, capacity and level of miniaturisation. The relevant technological developments are described in the report “Internet of Things in 2020: Roadmap for the Future”, which was prepared for the European Commission by the European Technology Platform EPoSS. In addition to these future technologies, many less ambitious yet solidly established technologies such as the two-dimensional bar code and passive RFID tags will continue to be of importance for a variety of applications.

In recent months, attention has focused increasingly on the issue of network architecture and administration – in other words, on the infrastructure of the Internet of Things. These infrastructural issues will involve complex tasks in terms of both software and security technology. In order to deal effectively with the heterogeneity of hardware components, technological solutions to ensure interoperability will be necessary. It will also be necessary to ensure compatibility regarding the various standards for unique identification (e.g. EPC, ucode, IPv6).

Because of their cross-border nature, many of these issues can be addressed effectively only at the European or global level. Germany welcomes the conference in Nice as an appropriate platform to utilise and advance current discussions on RFID to achieve this aim.

Networks and new services

The Internet of Things and the comprehensive use of RFID technology require new networks and services in order to move goods and services in a reliable and targeted manner via the Internet. The issue of how to structure an "Internet of the future" raises the question of whether directories and services should be organised in a centralised or decentralised manner. For example, current discussions have focused closely on the Object Naming Service (ONS), which is operated by the non-profit industry organisation EPCglobal as a root directory for classifying identifiers stored in RFID tags. In the trade and consumer goods sectors, the ONS system is operated in a centralised manner: system operation is carried out on the basis of EPCs (electronic product codes) and is performed on behalf of GS1/EPCglobal by a U.S.-based company using a local server. This model of operation raises the question of whether users have adequate market access and hence whether the Internet of Things would be fully and stably independent. In addition, if the Internet of the future were to have a centralised infrastructure and database structure, this would raise security questions as well as questions concerning the availability and protection of sensitive data in industry and commerce, in public administration, and in the private sphere as well. For example, data concerning the execution of state responsibilities must be protected against third-party access.

Against this background, the Nice conference would appear to provide an appropriate forum to ensure that the European discussion of RFID also focuses on issues of governance and the future structure of the Internet of Things. A pilot project involving a French ONS root is designed to make a practical contribution to both the usefulness and feasibility of a future European ONS system. In order to enable a substantive dialogue between government and industry, it is crucial that technological, infrastructural, organisational, economic, legal, and security questions on these matters be addressed in a concerted manner in the future.

Privacy and data protection

Discussions on data protection and the impact of RFID applications on privacy are still ongoing and are still oriented toward the still largely hypothetical scenario of RFID-tagged retail products. Due among other things to high cost of RFID tags, the comprehensive use of RFID at the level of consumers is likely not in the short term but rather in the medium term.

However, it is already clear that the acceptance and trust of consumers and RFID users are key factors for enabling RFID to be introduced successfully. For this reason, the Federal Government of Germany welcomes the European Commission's initiative with respect to a Commission Recommendation on "the implementation of privacy, data protection and information security principles in applications supported by RFID". The draft text of this Recommendation was unveiled by the Commission in early 2008 within the framework of an online public consultation and is currently being revised on the basis of the consultation results. Thus it is important to support the call for all stakeholders in government, industry and civil society to work together to develop best

practice standards for data protection, risk management and consumer protection. In this process, it is crucial to ensure the protection of personal data particularly through preventive privacy impact assessments, the development of technologies that are conducive to data protection, and public awareness campaigns. The Recommendation provides for special transparency measures regarding the use of RFID systems in retail trade. If an RFID application is used to process personal data, or if a privacy impact assessment finds a considerable level of probability that the application will generate such data, the retailer must deactivate the RFID tag at the point of sale unless the customer expressly requests otherwise. What is particularly important here is to establish a more precise definition of “personal data” in order to ensure that EU Member States implement the Recommendation appropriately.

In addition, apart from the issue of whether data stored on RFID tags will be used to enable the identification of specific individuals, it will be necessary to assess whether preventive data protection measures should be taken as soon as an RFID tag enters the realm of the consumer. And this includes the question of automatically deactivating RFID tags at the point of sale (opt-in). To the greatest extent possible, the necessary data protection measures should be taken in the form of voluntary commitments by industry.

The use of an RFID logo represents one potentially important measure for enhancing consumer trust and transparency regarding RFID technologies. In Germany, the *Informationsforum RFID* has launched a corresponding initiative to develop a labelling procedure for retail products containing RFID technology.

Prospects after Nice

In order to strengthen Europe’s standing in the ICT sector, it will be of primary importance to enhance transparency and trust in RFID and other new Internet technologies. For this reason, we welcome the European Commission’s announcement that it intends to press forward with the Internet of Things by working together with the Member States and by engaging in international dialogue, particularly with the United States and Asia. We also welcome the Commission’s planned Communication on the current status and challenges of a future Internet of Things, which is expected in late 2008 or early 2009 and which will focus on how to adapt general conditions in Europe in order to best prepare and shape the “Internet of the future”. Here it is crucial to ensure that the Internet of Things is closely interlinked with the future design of the Internet, which must be outfitted to cope effectively with tomorrow’s technological and political challenges and which must provide expanded and improved services (Internet of Services). The necessary research activities and international collaborative projects must be targeted to achieve these objectives through specific tenders within the framework of the 2009-2010 work programme of the EU’s Seventh Research Framework Programme.

With the conference “Internet of Things – Internet of the Future” in Nice, we have a new impetus that will give a powerful boost to the development and widespread industrial use of both RFID as well as other new and innovative Internet technologies at the European level.

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