GRIFS
WORK PACKAGE 1
GLOBAL STANDARDS – SITUATION ANALYIS

Interim Report: Project Structure and Key Issues

The purpose of this paper is to describe the structure of the final GRIFS report on the RFID standards situation analysis, to outline proposals for an ongoing database of standards, and to discuss some of the key issues that need to be significantly addressed in the ongoing research.

This is seen as a first key step to achieve the defined objective for Work Package 1:

- To produce an overview report providing an inventory/state of the art on the development and implementation of RFID standards, on a global scale, identifying the standards bodies, the geographical and technical scope of the work, opportunities and risks of collaboration, including gap/overlap analysis.
- To hold an open meeting in Brussels to report on the current status and plan for the future co-ordination activities and the rest of the project.

It is also seen as an input contribution to Work Package 3, which has as part of its objective: "To launch the RFID Interoperability global standards dialogue" by identifying key areas where early efforts at co-ordinating activities might prove worthwhile.

This paper sets out a number of the key issues that we have identified during our initial research. We are not claiming that we have identified all the issues, and respectfully submit the paper for further and more detailed discussion at the GRIFS open day on 18 June 2008 and for general feedback by 15 July 2008 to the Project Administrator:

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1. Report structure

Initial agreement has been reached with the GRIFS project managers on the structure of the report to be delivered in September 2008. This is set out in Annex A. This structure may change as we undertake specific research, but at this stage can be considered as a reasonable view of the subject matter to be covered.

2. The database navigation and content rules

One of the project deliverables is to provide "an inventory/state of the art on the development and implementation of RFID standards" and we consider that this is source material for a database that will be represented as the standards map. Although this standards map will be used by those directly involved with the standards making process, we see a longer term application being of interest to other stakeholders such as systems integrators and end users. To this end the information needs to be structured in a manner that makes sense from the perspective of these stakeholders.

The proposed set of classifications is defined in Section 7 of the report structure (see Annex A). In the report, this is obviously organised as a list. In the longer term we see the need for a user-friendly approach that supports a more random entry point to the detailed information. Figure 1 shows an overview diagram covering a number of topics directly or indirectly associated with RFID system.

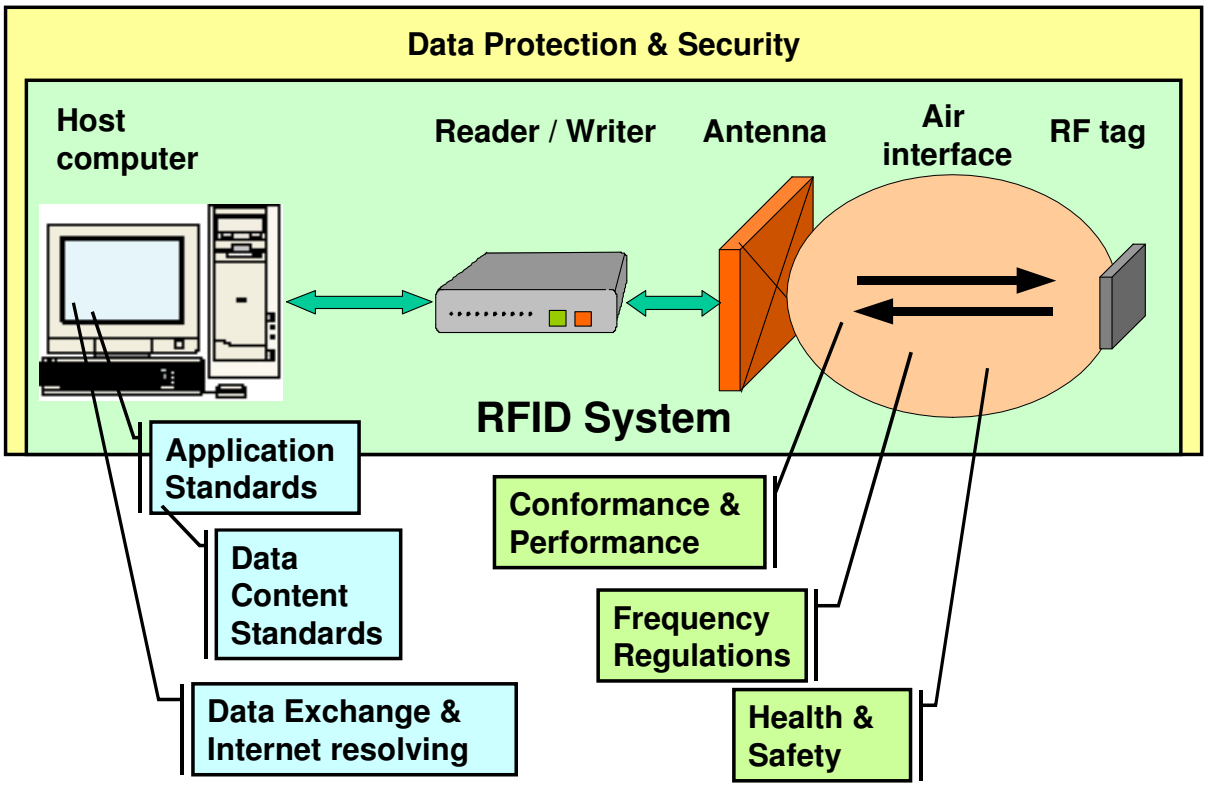
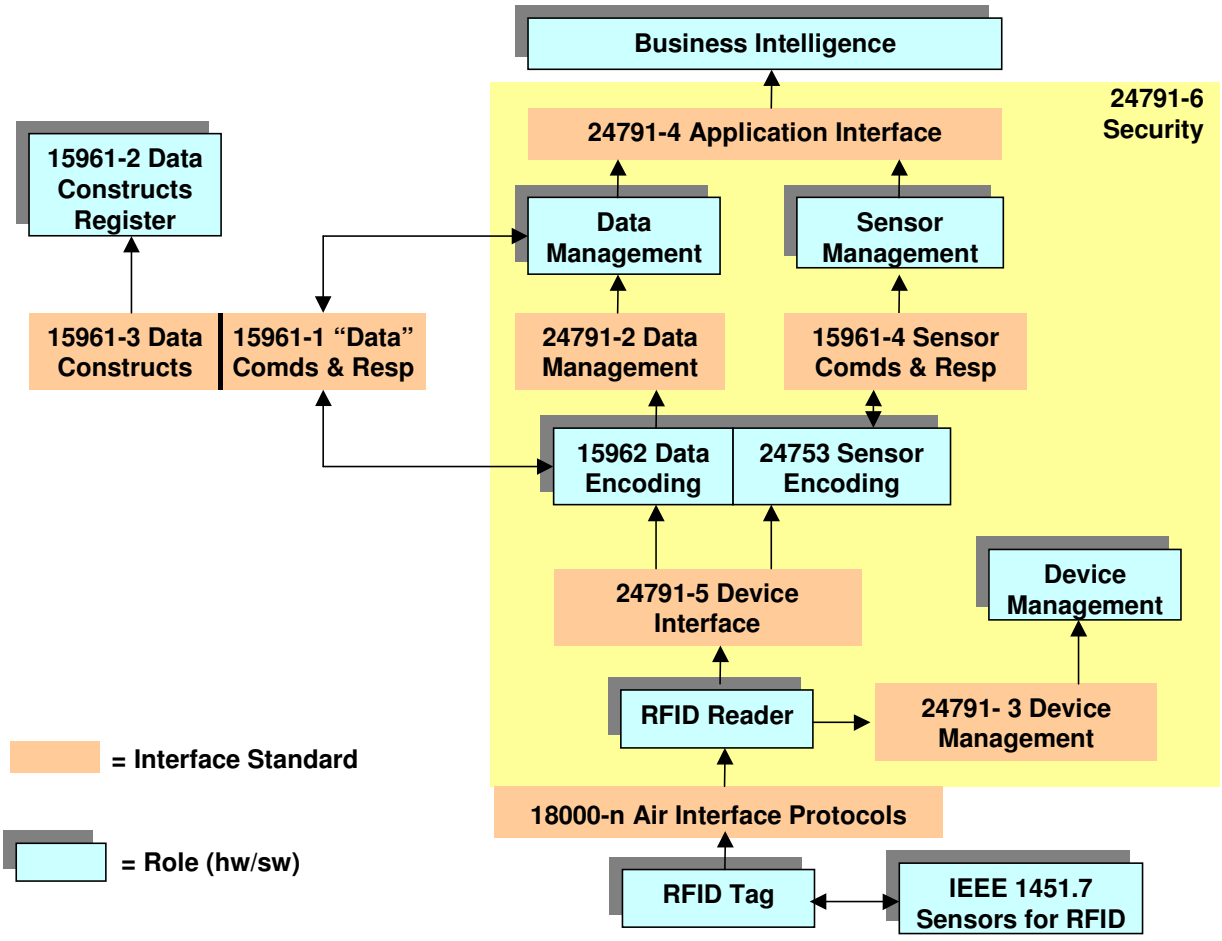


Figure 1: High Level Standards Map

What we envisage is that by clicking on any of the boxes in Figure 1, the user will be taken to a more detailed listing and description of the particular class of standards. For example, clicking on the "RFID System" box will take the user to a structure similar to that illustrated in Figure 2.



Note: This figure is based on the SC31 WG4 standards. If the principle is accepted of using this type of model, it will be modified to be more generic.

Figure2: RFID System – Detailed Standards Map

Figure 2 shows the relationship between the types of standards that are at the core of an RFID system. Again, the concept behind this figure is that by clicking on relevant boxes the user will be taken to the description and list of standards that support the particular functionality defined.

These structures will be used as guides in creating the database for the deliverable of this Work Package. However a final publicly accessible version needs to be developed for the on-going maintenance of the database after the project has been completed. We propose that the cells in the two figures could be used to access specific parts of the database.

Key issue for discussion
A challenge that we consider needs to be addressed is between the flat file list that can be incorporated into a report, or a more flexibly structured approach as discussed above. Comments are invited on the approach and structure.

There are many standards from formal standards development organisations and other bodies that can generally be defined as *RFID standards*. Although the quality and detail of

the source material varies depending on the standards organisation, the basic information that needs to be recorded about each standard consists of:

- Title
- Scope
- Responsible committee and url
- Publisher
- Date of publication, or if still a work in progress when publication is expected
- Normative references within the subject standard (where access is available)

> ***Key issue for discussion***
> *It is possible to provide significantly more details than a simple binary "published" or "expected date of publication" status about the standard. However, the assumption that is being made is that for the general reader of the database it is sufficient to establish whether the standard is possible to use, or is still in development.*

3. Maintaining the database

At the end of the GRIFS project, we expect to provide the source material to enable the subsequent publication of a comprehensive web-based database containing a significant portion of the standards that have any bearing on RFID systems. Building up this resource is part of the GRIFS project, maintaining it beyond the end of the project has so far not been discussed. There are various models that can be considered, and these are discussed in outline below:

- **A valued resource**:
  The task of maintaining the database could be part of a funded project for a service. This service would continue until the RFID standardisation process became stable, when there were few new updates.

- **A diminishing resource:**
  At the other end of the spectrum, the service could simply have no further ongoing maintenance activity after the end of Work Package 1. After a few months, the database will diminish in relevance and gradually become obsolete.

- **A community resource:**
  By using the design and control facilities of a **wiki**, it would be possible to continually maintain the resource by allowing anyone in the community to update information about RFID standards. The advantage of this approach is that the individual members of the community would update on a voluntary basis those aspects of the resource that they considered the most important. The disadvantage is that, in addition to having only "soft security" over the content, there is no certainty that the updated information would necessarily be accurate.

- **An editor-controlled community resource:**
  This is a variation of the scheme described above, where portions of the wiki would be under the control of particular editors (typically the secretariat of a work group). By having only a small part of the resource to maintain, individual editors would carry a small burden, yet maintain a highly accurate community resource. In addition, they will be publicising the activities of their work group to the wider community. We consider that this offers the best option of maintaining an accurate database for on-going exchanges of information. An additional point that will need to be resolved at the end of the project is predicated on the fact that MoUs will not be possible or necessary with all liaison

organisations. Rather than leave areas with little or no update facilities, some resource will be required to capture data from non-participating standards bodies, and authority provided to editor(s) to update in the absence of an MoU being in place.

This last option of an editor-controlled wiki is the one that we prefer. An additional discussion area is whether the wiki should be of a particular type known as a **structured wiki**. This allows the source behind the key to the structure in a similar way to a database, but with the flexibility of using different presentation styles.

4. Identified issues

The following subjects have been identified from our initial research as requiring discussion and further detailed research. The topics – and the details that follow - should be considered a bit like a sketch that might well result in a slightly different final picture. What follows ranges from a basic hypothesis, to a definition for further research, and even a fact-based initial conclusion.

4. 1. Comparison of development times and review times

The research will compare the timeline from initial request to final approval and publication for different types of standard. The purpose is to identify if lessons can be learned and transferred between processes. While we acknowledge that fundamental procedures will not be changed, say by JTC1 for the development of RFID technology standards, it is worth highlighting various issues.

The types of standards that are the subject of the research require significant development work, and often the formal process assigns more time to the review process. Even within the constraints of the formal procedures we consider that there are methods that can be adopted that can increase effectiveness.

Certainly, the phasing of standards development between organisations is unknown, or at best learnt after the event. Early knowledge of such developments can also assist in the more efficient development and co-ordination of any given subject standard. This is illustrated schematically in Figure 3.

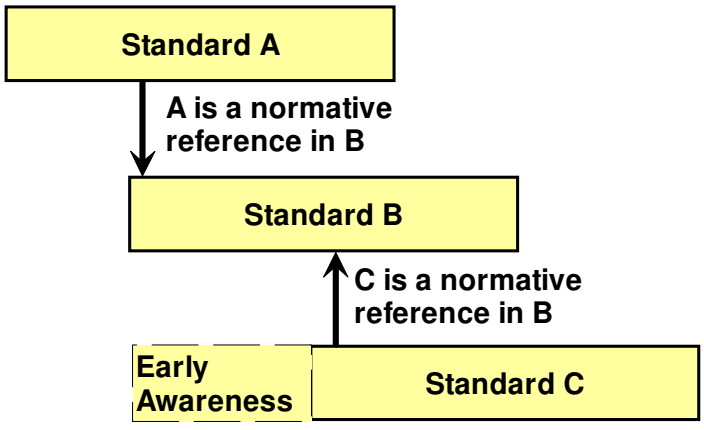


Figure 3: Dependency between standards

In this illustration, the start of Standard C is not until part way through the development of Standard B, but once information becomes available Standard C becomes a normative

reference. Standard B probably has to be re-written to address the new relationship. Earlier awareness of the activities could have helped to develop Standard B more effectively.

An even worse scenario is that the benefits of Standard C are totally ignored and Standards B and C contain conflicting technical content.

4. 2. Parallel developments of similar subject matter– targets for MoU

We have already identified a number of areas where a particular standards-related subject matter is being addressed in more than one standards making organisation. If our assessment is wrong of the overlap, then there is at least a strong need for understanding the scope and demarcation between the different activities.

The purposes of researching the candidate topic areas (see the sub-sections below) is to identify the potential benefit of an MoU between standards development organisations. When reviewing these identified issues we would ask the reader to consider whether the list is comprehensive enough, and if not, to propose other topics for research. We would also welcome specific contributions on any of the identified areas. Besides assisting with the gap analysis for Work Package 1, the information gathered on these identified issues may well help kick start the activities of Work Package 3.

4.2. 1 EPCglobal and ISO

It is a well-known fact that the EPCglobal air interface protocol at UHF is identical to that of ISO (more precisely ISO/IEC JTC1 SC31). The same is likely to apply to the EPCglobal air interface protocol at high frequency.

The position in 2008, is that ISO has the latest version of the EPCglobal UHF standard and is adding additional features for battery assist and sensors. At the same time, the initial version of the high frequency tag specifications is still formally being awaited by ISO. The point is not to criticise either organisation, but advanced notification of the EPCglobal high frequency standard would have helped ISO move ahead significantly earlier – estimated at about 18 months. Similarly EPCglobal might not take into consideration the work by ISO on sensors, (but the assessment is speculative).

What might not be so clear, is that whereas the ISO software system infrastructure standards relate to the EPCglobal standards, they include significantly more features. So the situation is that there will be significant overlap in subject matter between these two organisations.

4.2. 2 SC17 smart card and RFID item management overlap at 13.56 MHz

The relationship between the JTC1/SC17 ISO/IEC 15693 standards and the JTC1/SC31 ISO/IEC 18000-3 Mode 1 standard has been a long established. In fact, the two standards – although different – are referred to by end users in a completely interchangeable manner.

One of the established areas is the rule for sharing code for the AFI system. This is already the subject of an MoU that has been implemented by SC31 including the formal establishment of a Registration Authority. The prevailing situation with SC17 is not so clear.

Although air interface experts knew the links between ISO/IEC 14443 – another SC17 standard – and ISO/IEC 18000-3 Mode 1, this linkage is not so generally understood. The effect of this is that some smart card applications that interface with RFID for item management applications might result in a risk of an overlap of data, or at the least confusion in data handling. An example of this potential risk is in the library community where RFID compliant with 18000-3 Mode1 is used on the loan items and city or government issued

smart cards compliant with 14443 are used for the membership cards. In future, the potential for clash might increase with the adoption of NFC (see below).

4.2. 3 Near Field Communication Consortium and ISO

As background information, Near Field Communication (NFC) enables smart card and RFID functionality to be added to a mobile telephone. These are devices that work at 13.56 MHz. As part of the development process, the NFC Consortium did liase with ISO and a number of standards have been addressed by ISO/IEC JTC1 SC6.

The mobile phone acts as a smart card emulator and therefore readers compliant with ISO/IEC 14443 are able to exchange data with the mobile phone. NFC-compliant phones are also capable of reading and writing to tag compliant with ISO/IEC 14443. This particular standard uses the same basic air interface protocol as used in ISO/IEC 15693 and ISO/IEC 18 000-3 Mode 1.

Converting this jumble of standards into something meaningful, the technical description above indicates that a mobile phone will be able to read and write to RFID tags that have a relatively low a level of security, and have been used in applications for many years.

The technical implications have only emerged within recent months, whereas the work activities of the relevant bodies: NFC Consortium, JTC1/S6, JTC1/S17, and JTC1/31 would have been better served by a closer understanding of the standards and their implications at a much earlier stage.

4.2. 4 Sensors – everyone claims ownership

The current work of SC31/WG4 is quite clearly defined. Work items on the application interface deal with rules for encoding and decoding sensor-related data (ISO/IEC 24753), and commands interfacing with the application (ISO/IEC 15961-4). With respect to the air interface standards, sensor functionality is being specified in ISO/IEC 18000-6 for Type C and for TOTAL. SC31/WG5 and WG6 also have the potential to add sensor functionality to specific work items within their scope.

The IEEE 1451 series of standards define different types of sensor functionality. IEEE 1451.7 is currently being developed to specify sensors for RFID. The IEEE activity links back to the work of SC31/WG4.

Many other standards developments appear to be in progress for sensors, based on various press stories and outline plans. These cover generic terms such as "sensor networks", which, on some interpretations, can incorporate all of RFID. They also cover more futuristic developments such as "motes" or "sensor dust".

All these developments range from early-stage "PowerPoint presentations" to actual work items that are proceeding to full publication. There is certainly a need to clarify the status of the actual work item activities by standards making bodies to establish potential areas of overlap, conflict, and more complex inter-relationships.

4.2. 5 OID issues and activities of ITU

For unambiguous identification of data, the SC31/WG4 application interface standards make use of the object identifier (OID) structures specified in ISO/IEC 9834-1 (also published as ITU-T Recommendation X.660). A recent announcement by the ITU-T for the publication of Recommendation X.668 requires significant investigation. The purpose of this new Recommendation is to provide a short form OID explicitly for encoding in RFID tags. The

recommendation assumes – not necessarily correctly – that there is limited encoding capacity of RFID tags.

As the announcement from the ITU-T was only made in May, the subject was discussed at the recent JTC1 series of meetings in early June. Further work is required to establish the scope that is intended for this new Recommendation – itself to be an ISO/IEC standard – as follows:

- If the intention is to apply the Recommendation to new classes of data, then the proposal merits adoption in the encoding rules for RFID.
- If the intention is to apply this new OID to the legacy data, then it is likely to disrupt and confuse many AIDC application standards developers, because it will give the impression that they need to change their legacy data systems to encode data in an RFID tag.

4. 3. Intellectual Property

Issues surrounding the rules for intellectual property (IP) are becoming an increasing concern. ISO operates a Reasonable And Non-Discriminatory (RAND) IP policy. Other standards organisations operate similar rules, but the subtleties of membership rules makes the comparison more complex. For example, ETSI is a membership organisation and has specific rules for intellectual property among its members.

EPCglobal is a more specific case, because to date, all of the technology standards published by EPCglobal claim to be IP free. There is no doubt that this is a true reflection of the situation among the members of the EPCglobal. What is not clear, is what happens when non-members make use of EPCglobal standards and risk infringing as yet undeclared IP. This point has recently been raised at the JTC1/SC31 standards meetings, and a possibility is for specific IP to be declared when standards are referenced in an ISO standard.

The issue primarily needs to be addressed in those situations where the availability of intellectual property to third parties might be different depending on the rules of the original publisher and the rules of the publisher making reference. We feel that it is relatively important to research and define the IP rules for various major standards-making organisations and address these as part of the CEN work package.

We recommend that other parts of the GRIFS project undertake more detailed research to explore the situation when one standards-making organisation makes a normative reference to a standard published by another organisation. The additional research should also consider the implications of adding new features to the base standard. This additional work should take into account these major features:

- The IP situation with respect to the exploitation of additional features added in the new standard
- The IP situation with respect to the exploitation by third-party organisations – this is particularly the case for ISO and CEN standards – that were not members of the original standards-making body.
- The declaration of any IP that might not be obvious because of an "IP-free" policy or the use of a patent pool

4. 4. Data exchange: UII resolving mechanisms over the Internet

EPCglobal has developed a solution for resolving EPC codes over the Internet using the Object Name Service (ONS), which is similar function to the Domain Name Service (DNS).

Many experts and organisations have made a false assumption that the EPC code structure is the only one that can resolve a Unique Item Identifier encoded in an RFID tag. Experts from the MIT Auto-ID Laboratory and from Internet domain service providers have made clear that it is possible to use the Internet Uniform Resource Name (URN) is to achieve this. There are long-established uniform resource names, including one for object identifiers. Because of the different hierarchical structures used for object identifiers and their very broad scope, an Internet resolver solution might not be immediately obvious. We feel that the solution lies in not trying to resolve the complete OID structure, but to build resolution systems based on specific top arcs of the OID system. Examples might include a specific resolver for the top arcs of:

- 1.0.15961.12 for IATA and baggage handling
- 2.27 for the newly proposed ITU-two short form OID

A solution for this is probably beyond the scope of the GRIFS project, and more detailed research should be undertaken as part of the CASAGRAS project.

For the purposes of the GRIFS project, we propose that research is undertaken to explore whether any of the established and registered URN schemes is supported by an existing system for resolving the URN over the Internet.

4. 5. Frequency – bandwidth at UHF

A number of concerns have been expressed about the different regional and national regulations that apply to the UHF bandwidth within the range of 860 to 960 megahertz (MHz). New ETSI standards have recently been published and are being implemented in Europe to increase the flexibility of the use of RFID technology within the UHF spectrum.

Some experts have expressed concern that an on-going problem exists because different countries only use a small part of the spectrum within the 860 to 960 MHz range requiring compromises in tag design. The suggestion is that greater harmonisation can be achieved by migrating more regulations away from the extremes of this range. Other experts disagree and consider that the bandwidth for tag operation is not a real problem. In their view the focus should be on ensuring that different regulatory authorities provide additional bandwidth within their domain to enable more channels be used, and also to enable application is to adopt improved channel management techniques.

The CEN Experts will call on the ETSI experts to clarify the various issues and to classify the importance of these. This should enable other parts of the GRIFS programme to ensure that liaison is carried out with the regulatory authorities to harmonise the most important features of the use of RFID in the UHF spectrum.

4. 6. Privacy

Although it might appear to be logical to base our research on the European Union Recommendation for privacy, we understand that the final text will not be known until after our initial research review process has been completed. Also, it is unclear as to the implications of the ultimate content of this recommendation. Therefore, research needs to be more broadly based; so we intend to include developments and actions by other authorities.

We are aware that a number of claims had been made about the technological way of implementing privacy enhancing features in RFID tags. We are also aware that the installed base of different RFID technologies, including the number of users – sometimes government authorities – and technology vendor's operating on a global basis might make it difficult to retro-engineer any one solution in a number of tag architectures and air interface protocols.

To this end, we will address a number of the identified proposed solutions and consider the implications for implementing these into three or four types of common RFID tag. The purpose of this particular exercise is to indicate requirements for MoUs between the standards making organisations associated with air interface protocols and those writing privacy regulations.

It should also be made clear at this early stage of our research that CEN submitted a work item proposal to the DG Enterprise in September 2007 to address this topic and security issues. As yet, the CEN Central Secretariat has received no decision on the support for this work item.

4. 7. Security

As illustrated in Figure 1, the security aspects of RFID span the range of devices and component applications. Therefore, many standards-making organisations are expected to claim some justification in developing specific security standards. Some of these standards might be explicit to air interface protocols (even particular interface protocols), to device types, and even some interface standards. However, much of the security aspects could well apply to the general computer network issues.

Without Memorandum of Understanding between the various standards-making organisations, the future could see a number of conflicting security standards. What might be worse, is that a security standard developed within one standards-making arena might fail to identify a particular feature – be it a problem or solution – that is well known in another arena.

The research on security should cover two phases. The first is to identify areas where RFID security is claimed to be part of the scope of the work item activity of the standards-making organisation. The second phase, which might have to be addressed after our September 2008 report, is to call on expert collaborators to classify the RFID security subject matter.

We are also aware of existing and new initiatives to address security for RFID. We feel that general security issues should be addressed at the international level. However, where its security is specifically related to privacy, and possibly to other regional considerations, then the subject matter needs to be addressed within Europe.

Annex A: GRIFS TASK 1 – Report Structure

1. Task definition and approach to the research

1.1 Term of reference
1.2 The RFID architecture model (create generic model based on EPC and ISO structures)
1.3 Methodology

2 A critical epoch

2.1 The formation of ISO/IEC JTC1 SC31 WG4
2.2 RFID standards and applications before the epoch
2.3 Bar code applications and application standards before the epoch
2.4 Implications for early RFID standardisation activities and the developments since the epoch
2.5 ISO/IEC JTC1 SC31 WG4
2.6 GS1, the Auto-ID Center, EPCglobal

3 Stakeholders in the standardisation process

3.1 Formal standards at the international level (ISO/IEC, ITU-T)
3.2 Formal standards at the European level (CEN, CENELEC, ETSI)
3.3 RFID technology providers
3.4 User organisations
3.5 Governments and regulators (radio regulations, safety, data protection, privacy)

4 The standards making process

4.1 ISO/IEC, ISO, CEN
4.2 ITU
4.3 ETSI
4.4 IEEE
4.5 EPCglobal and GS1
4.6 Typical application standards
4.7 Overall comparison and critical analysis

5 The established bar code standards

Most of the industry and commercial sectors that are likely to adopt RFID have already given consideration to bar code and implemented application standards. The intention is to identify, as of the mid-90s, key sectors in terms of market significance for bar code and then, for a number of applications, identify potential issues that impact the take-up of RFID.

6 Established smart card issues

6.1 ISO standards
6.2 Stakeholders
6.3 Differences with current generation RFID

7 Classification of RFID and related standards and regulations

7.1 Frequency regulations
7.2 Health and Safety regulations
7.3 Environmental regulations (e.g. WEEE, packaging waste)
7.4 Data protection and privacy regulations
7.5 Air interface standards
7.6 Sensor standards