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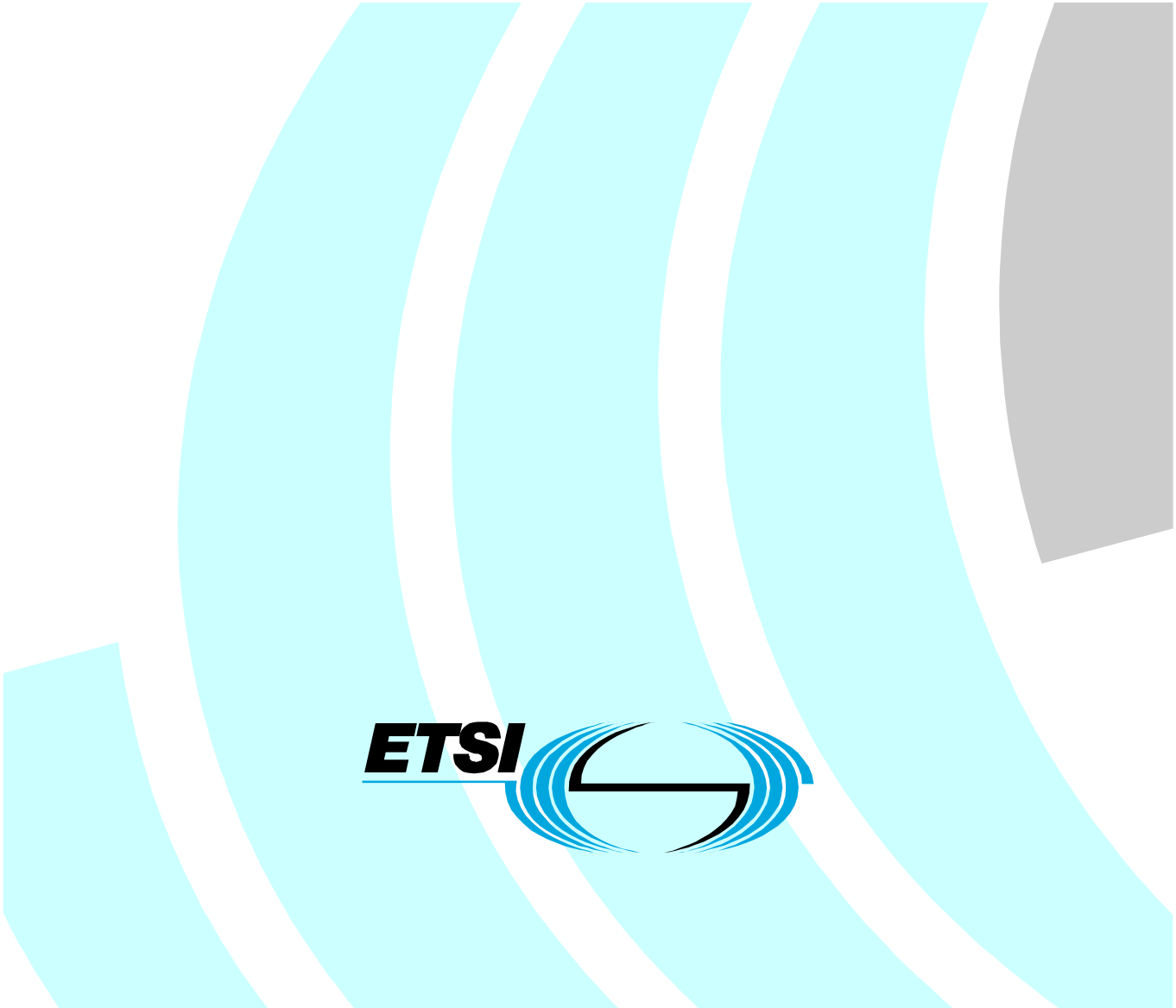
Technical Report

Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Overview of Radio Frequency Identification (RFID) Tags in the telecommunications industry



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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN).

Introduction

RFID is an automated technology used to gather information about a product, place, person or transaction, quickly and easily, eliminating human error. In general, it provides a link to data without the need to make contact with the item, without line of sight or in harsh or dirty environments that may limit other auto ID technologies (e.g. bar codes and 2D symbols). It is a proven technology, in use for over 10 years in a cross section of applications, such as road telematics (e.g. toll paying systems), livestock identification, access control, retail product theft management, shop floor manufacturing, etc.

1 Scope

The present document provides a technology and standards overview, lists some potential applications and presents some issues associated with implementing RFID in Telecommunications.

2 References

For the purposes of this Technical Report (TR), the following references apply:

[1] ETSI TS 102 359: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Equipment Information in the Management Information Base (MIB)".

[2] ETSI TS 102 209: "Telecommunications and Internet converged Services and Protocols for Advancing Networks (TISPAN); Telecommunication Equipment Identification".

[3] ISO/IEC 18000 (all parts): "Information technology - Radio frequency identification for item management".

[4] ITU-T Recommendation M.1400 (2004): "Designations for interconnections among operators' networks".

[5] ITU-T Recommendation M.3320: "Management requirements framework for the TMN X-Interface".

[6] ISO/IEC 15961: "Information technology - Radio frequency identification (RFID) for item management - Data protocol: application interface".

[7] ISO/IEC 15962: "Information technology - Radio frequency identification (RFID) for item management - Data protocol: data encoding rules and logical memory functions".

[8] ISO/IEC 15963: "Information technology - Radio frequency identification for item management - Unique identification for RF tags".

[9] ISO/IEC 18001: "Information technology - Radio frequency identification for item management - Application requirements profiles".

[10] ISO/DIS 17363: "Supply chain applications of RFID - Freight containers".

[11] ISO/DIS 17364: "Supply chain applications of RFID - Returnable transport items (RTIs)".

[12] ISO/DIS 17365: "Supply chain applications of RFID - Transport units".

[13] ISO/DIS 17366: "Supply chain applications of RFID - Product packaging".

[14] ISO/DIS 17367: "Supply chain applications of RFID - Product tagging".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

Active RFID Tag: RFID tag that has its own power source

Passive RFID Tag: RFID tag that does not have its own power source

Service provider: As defined in ITU-T Recommendation M.1400, A general reference to an operator that provides telecommunication services to Customers and other users either on a tariff or contract basis. A Service Provider may or may not operate a network. A Service Provider may or may not be a Customer of another Service provider (see clause 1.4.6 of ITU-T Recommendation M.3320).

Equipment Supplier: Equipment life cycle (see TS 102 209 [2])

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

2D	Two Dimensional
CPG	Consumer Package Goods
EI	Equipment Identity
MIB	Management Information Base
RFID	Radio Frequency Identification

4 RFID Technology Overview

This clause contains background information on RFID.

4.1 Types of RFID Tags

The following are type distinctions among RFID tags:

- Active or Passive
  - Active: contain their own power source.
  - Passive: do not contain a power source and, as such, are completely dependent on power from the RFID reader to activate them.
- Read only or read/write
  - Read only tags: can be updated only one time.
  - Read/write tags: can be updated multiple times.

4.2 RFID Tag Characteristics

RFID characteristics include:

- Memory size: determines how much information can be stored.
- Frequency: a variety of frequencies are available for different uses.
- Size: range from thumbnail to brick.
- Antenna size: determines, with the power of the reader, the range at which the tag can be read.

The relationship of each of these characteristics to the needs of the telecommunications industry will need to be understood.

Some of these characteristics are standardized into RFID tag types in ISO/IEC 18000-n [3], where n denotes the tag type and detailed number of the ISO/IEC document describing that type.

4.3 Standards Overview

The following lists some of the relevant standards with a brief description, if needed:

- ISO/IEC 18000 [3]:
  - Part 1: "Reference architecture and definition of parameters to be standardized" - Determines the common parameters to be defined in an item identification air interface standard, the method and means of their definition and to provide a common format for their elaboration and definition.
  - Part 2: "Parameters for air interface communications below 135 kHz" - Specifies the physical layer for communications between interrogator and tag.
  - Part 3: "Parameters for air interface communications at 13,56 MHz".
  - Part 4: "Parameters for air interface communications at 2,45 GHz".
  - Part 6: "Parameters for air interface communications at 860 MHz to 960 MHz".
  - Part 7: "Parameters for active air interface communications at 433 MHz" - Defines the air interface for radio-frequency identification (RFID) devices operating as an active RF tag in this band for item management applications.
- ISO/IEC 15961 [6] - Specifies the air interface-independent data protocol.
- ISO/IEC 15962 [7] - Specifies the overall process and the methodologies developed to format the application data into a structure to store on the RF tag.
- ISO/IEC 15963 [8] - Describes numbering systems for the unique identification (unique ID) of RF tags which is required as part of the write operation to RFID tags.
- ISO/IEC 18001 [9].
- ISO/DIS 17363 [10].
- ISO/DIS 17364 [11].
- ISO/DIS 17365 [12].
- ISO/DIS 17366 [13].
- ISO/DIS 17367 [14].

4.4 Current Status of RFID in Other Industries

RFID implementations in other industries and their statuses include:

- Many industries use RFID already e.g. road tolls (VinPass).
- The pharmaceutical industry is investigating using RFID to tag prescription medicines.
- The retail/wholesale consumer products industry is trialing use of RFID tags for transport units and product packages, but not on individual products.

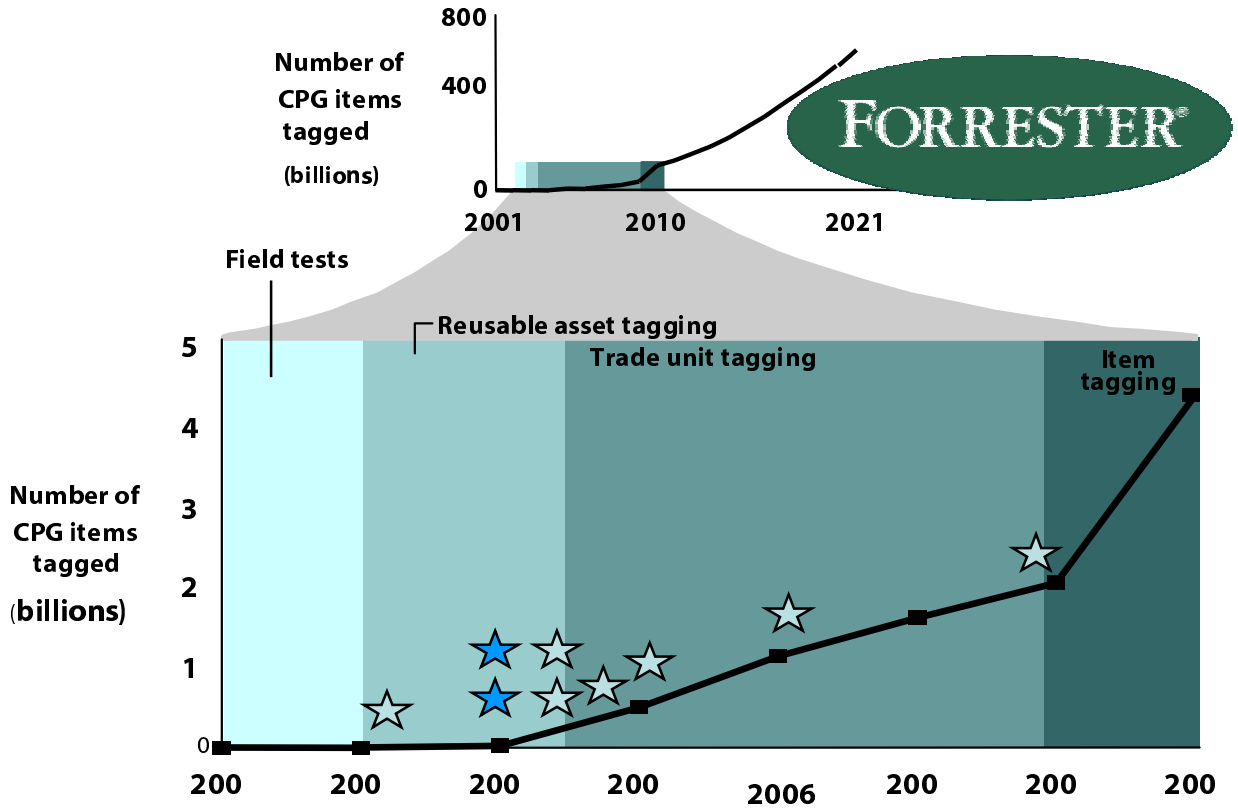

Figure 1: RFID tagged objects in consumer package goods (CPG) - from EPC global presentation

4.5 RFID relationship to other identification methods

RFID is one of a range of methods that can be used to identify an item. There are three major types of these identification methods:

- Human: a human reads a label on the item (package, card, chassis, etc.) and either uses or copies the information found. This could display the EI (TS 102 209 [2]), manufacturer's part number, a local ID, and/or another ID.
- Scanning: there are two major types of scanning technologies:

  i) Visual scanning

  1) Linear bar code labels: these include the labels found today on a wide variety of retail and telecommunications products.

  2) Two dimensional labels (2D): these labels can hold much more information in a smaller space than linear bar code labels. These are widely used today, for example, shipping companies (e.g. DHL, FedEx, United Parcel Service (UPS)) and to encode information on government documents. Contents are normally encoded in a tag-value format according to ISO/IEC standards.

  ii) RFID scanning

  1) Uses radio frequency waves to transfer data between a reader and a movable item to identify, categorize and track it.

  2) Does not require physical line of site for contact between reader and the tagged item.

- Auto discovery: for items (e.g. cards, chassis) that are attached to the telecommunications network. Auto discovery can retrieve information from the MIB about that item.

Thus, RFID is simply one of a number of available methods that can be used to identify items. Comparisons of these methods include:

- Visual scanning (i.e. bar codes labels and 2D labels) has obvious advantages over human.
- RFID can scan unseen items and can scan several items at a time (e.g. within a space (e.g. room, truck)).
- For items that are attached to the network and have MIB information available, this is the most efficient method.

5 Potential applications of RFID

The most promising uses of RFID in the telecommunications industry fall into two primary areas:

- Product Identification and Tracking
  - Tracking of equipment type: RFID tags on telecommunications equipment (e.g. cards, chassis, test sets) could ease tracking and inventory of these items. In warehouses, RFID readers could track all items, eliminating the need for human data entry.
  - Tracking of individual items: RFID tags could also ease tracking of item serial numbers in the repair processes and other processes (e.g. warranties, asset tracking, etc.)
- Package and Shipment Tracking
  - For package and shipment tracking, manual entry and/or visual scanning could be eliminated, thus saving work and making records more accurate.

NOTE: Data elements included in read-only RFID tags would likely match those currently designed into 2D labels (e.g. per ATIS standards) and/or those defined as static (non-updatable) entries in the equipment MIB (TS 102 359 [1]).

6 Implementation issues

While the potential for use of RFID shows a great deal of promise, there are a number of issues that need to be addressed prior to wide implementation. These issues include:

- Current costs for RFID tags are relatively high compared to other tracking solutions e.g. € 0,40 for passive RFID Tags, and € 32 for active RFID Tags. These are expected to decrease over the next few years.
- Migration costs for equipment suppliers and service providers.
- RFID tag size. Telecommunications cards are small and provide little space for tags. RFID Tags might be 25 mm square. Circuitry for a tag might be included on the card itself, but testing needs to be done to assure that there are no negative impacts on the equipment.
- The distance at which RFID tags are readable will need to be tested. Both small antenna size and proximity of metal materials will diminish the effectiveness of RFID tags.
- Introduction of RFID tags on equipment items in environments where other identification methods (either human readable labels or bar code/2D labels) are used, require the need for process improvement analysis to determine whether to retrofit RFID tags on existing equipment.
- Interference with other equipment or requirements e.g. EMC, EMF.

NOTE: Some testing has already shown that other transmitting devices (such as wireless phones) could adversely impact the operation of telecommunications equipment.

- Different regional frequency allocation and power limitations.
- Reading reliability e.g. all tag to be read accurately at the same time.
- Legal and regulation restrictions.
- Testing is required to determine the effect of RFID signals in an exchange/central office environment.

History

Document history		
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