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Information technology — Data protocol for radio frequency identification (RFID) for item management —

Part 2: Registration of RFID data constructs

Technologies de l'information — Protocole de données relatif à l'identification par radiofréquence (RFID) pour la gestion d'objets —

Partie 2: Enregistrement de constructions de données RFID

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents) or the IEC list of patent declarations received (see http://patents.iec.ch).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 31, *Automatic identification and data capture techniques*.

This first edition of ISO/IEC 15961-2, together with ISO/IEC 15961-1, ISO/IEC 15961-3 and ISO/IEC 15961-4, cancels and replaces ISO/IEC 15961:2004, which has been technically revised.

A list of all parts in the ISO/IEC 15961 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The technology of radio frequency identification (RFID) is based on non-contact electronic communication across an air interface. The structure of the bits stored on the memory of the RFID tag is invisible and accessible between the RFID tag and the interrogator only by the use of the appropriate air interface protocol, as specified in the appropriate part of ISO/IEC 18000. The transfer of data between the application and the interrogator in open systems requires data to be presented in a consistent manner on any RFID tag that is part of that open system. Application commands from the application and responses from the interrogator also require being processed in a standard way. This is not only to allow equipment to be interoperable, but in the special case of the data carrier, for the data to be encoded on the RFID tag in one system implementation for it to be read at a later time in a completely different and unknown system implementation. The data bits stored on each RFID tag need to be formatted in such a way as to be reliably read at the point of use if the RFID tag is to fulfil its basic objective.

Manufacturers of radio frequency identification equipment (interrogators, RFID tags, etc.) and the users of RFID technology require a standard-based data protocol for RFID for item management. ISO/IEC 15961 and ISO/IEC 15962 specify this data protocol, which is independent of any of the air interface standards defined in ISO/IEC 18000. As such, the data protocol is a consistent component in the RFID system that may independently evolve to include additional air interface protocols. The International Standards that comprise the data protocol are:

— ISO/IEC 15961-1, which defines the transfer of data to and from the application, supported by appropriate application commands and responses;

— this document (ISO/IEC 15961-2), which defines the registration procedure of RFID data constructs to ensure that the data protocol supports new applications, in a relatively straightforward manner, as they adopt RFID technology. This can be achieved by the Registration Authority publishing regular updates of RFID Data Constructs Register that have been assigned, and as a means of incorporating these updates into the processes of ISO/IEC 15961-1;

— ISO/IEC 15961-3, which defines the RFID data constructs and the rules that govern their use;

— ISO/IEC 15961-4, which defines the transfer of data associated with sensors and batteries to and from the application, supported by appropriate application commands and responses;

— ISO/IEC 15962, which specifies the overall process and the methodologies developed to format the application data into a structure to store on the RFID tag.

Information technology — Data protocol for radio frequency identification (RFID) for item management —

Part 2: Registration of RFID data constructs

1 Scope

This document specifies the procedural requirements to maintain specific RFID data constructs. The data constructs are associated with managing open and closed applications that utilise RFID systems which conform to the data protocol defined in other parts of ISO/IEC 15961 and ISO/IEC 15962, and the air interface protocols of ISO/IEC 18000.

It also outlines the obligations of the Registration Authority and the application administrators, with respect to:

— the allocation of AFIs to particular applications defined by the application administrator;

— the allocation of data formats to particular applications defined by the application administrator;

— the registration of Root-OIDs, compliant with ISO/IEC 9834-1, to any Unique Item Identifiers used in applications defined by the application administrator;

— the registration of Root-OIDs, compliant with ISO/IEC 9834-1, to any other data used in applications defined by the application administrator;

— the registration of various table-driven encoding schemes, compliant with ISO/IEC 15962.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 15961-3:2019, *Information technology — Radio frequency identification (RFID) for item management: Data Protocol — Part 3: RFID data constructs*

ISO/IEC 15962, *Information technology — Radio frequency identification (RFID) for item management — Data protocol: data encoding rules and logical memory functions*

3 Terms, definitions and abbreviated terms

For the purposes of this document, the following terms, definitions and abbreviated terms apply.

3.1 Terms and definitions

3.1.1
application administrator
organization that is responsible for defining and managing a particular application standard using RFID technology

3.1.2
Application Family Identifier
mechanism used in the data protocol and the air interface protocol to select a class of RFID tags relevant to an application, or aspect of an application, and to ignore further communications with other classes of RFID tags with different identifiers

3.1.3
arc
specific branch of a hierarchical Object Identifier tree

Note 1 to entry: The top three arcs of Object Identifiers relevant to RFID, compliant with ISO/IEC 9834-1, are defined in ISO/IEC 15961-3.

3.1.4
data format
mechanism used in the data protocol to identify how Object Identifiers are encoded on the RFID tag, and (where possible) identify a particular data dictionary for the set of relevant Object Identifiers for a specific application

3.1.5
Object
well-defined piece of information, definition or specification which requires a name in order to identify its use in an instance of communication

3.1.6
Object Identifier
value (distinguishable from all other such values) which is associated with an Object

3.1.7
Relative-OID
Object Identifier comprising the remaining arc or arcs positioned after a common Root-OID (for the first and subsequent arcs)

Note 1 to entry: The common Root-OID is often implied by other data constructs and not encoded in the RFID tag.

3.1.8
Root-OID
particular Object Identifier that constitutes the first, second and subsequent common arcs of a set of Object Identifiers (hence the common root)

Note 1 to entry: The Root-OID followed immediately by the Relative-OID equates to the complete Object Identifier.

3.1.9
Unique Item Identifier
mechanism that uniquely identifies a specific entity (e.g. a product, transport unit, returnable asset) during its life within a particular domain and scope of a code system

Note 1 to entry: When used with this data protocol, the particular Object Identifier that defines the Unique Item Identifier shall rely on the fact that each instance of its Object shall be unique and unambiguous with all other related Objects.

3.2 Abbreviated terms

AFI Application Family Identifier

OID Object identifier

RA Registration Authority

UII Unique Item Identifier

4 User considerations of RFID data constructs

Data constructs shall be applied in accordance with Annex A to ensure that application standards are correctly structured. Furthermore, an understanding of the functions of the data construct rules is essential for application administrators to apply for the relevant registration as defined in Clause 5.

5 Application administrators

5.1 General considerations

The procedure for the requests for RFID data constructs shall be as follows.

a) Applications for RFID data constructs shall contain all of the elements necessary to fulfil the requirements specified in ISO/IEC 15961-3 for Application Family Identifiers, data formats, Unique Item Identifiers and other data objects (if relevant to the application).

b) Application forms shall be made available on request from the Registration Authority.

c) A separate application form should be submitted to the Registration Authority for every RFID data construct set requested.

d) Only applications that have been duly completed shall be acceptable for registration by the Registration Authority.

e) All applications shall be reviewed by the Registration Authority for the registration and the assignment of a set of RFID data constructs. The Registration Authority may request additional information where further clarification is needed.

f) All completed application forms containing the assigned RFID data constructs (AFI, data format, and any Object Identifier) assigned should be retained by the involved parties.

g) The Registration Authority should obtain evidence of the use of the assigned RFID data constructs in the open application environment relevant to the applicant within a reasonable timeframe, preferably within 12 months of the date of the assignment.

5.2 Criteria for approval

Applications for RFID data constructs shall meet all the following criteria for approval and shall not comply with any of the criteria for rejection in 5.3:

a) only an identifiable authority over the particular open application environment for which RFID data constructs are used shall be acceptable;

b) the RFID data constructs being issued shall be for use in an open application environment;

c) only applicants represented in two or more countries shall be acceptable;

d) the RFID data constructs should be for immediate use, preferably within 12 months of the date of their issue.

5.3 Criteria for rejection

Applications for RFID data constructs shall be rejected by the Registration Authority when any of the following conditions exist:

a) the RFID data constructs issued to the applicant are not for use in an open application environment;

b) the RFID data constructs are not for immediate use, e.g. within 12 months from the date of issue;

c) ineligibility of applicant;

d) incomplete or incomprehensible information in application.

6 Registration Authority

6.1 Responsibilities

The Registration Authority[1)] shall be responsible for:

a) receiving and acknowledging applications from organizations wishing to have RFID data constructs assigned to their RFID open application environment in accordance with this document (see Clause 5);

b) processing applications;

c) notifying the applicants in writing as to the disposition of their application;

d) registering applicants that meet the criteria for approval set out in 5.2 as application administrators and assigning an AFI and data format; registering (or assigning) Object Identifiers for the UII and other item-attendant data for their open application environment; registering any table-driven encoding scheme

e) notifying unsuccessful applicants with reference to the relevant rejection clause (5.3); maintaining the database of application administrator identification information (see 6.2);

f) producing a register of basic RFID data constructs (see 6.2);

g) producing a register of the table-driven encoding schemes (see 6.2);

h) submitting a copy of the register of RFID data constructs, each January and July, to the secretariat of ISO/IEC JTC 1/SC 31;

i) retaining, as a permanent record, copies of all applications submitted to it, along with the disposition of each application.

6.2 Register of RFID data constructs

The Registration Authority shall maintain a database of information taken directly from the application form. A copy of each application received shall be maintained on file by the Registration Authority.

Based on the information contained in this database, the Registration Authority shall publish a register of RFID data constructs on a dedicated web page. The register shall be published in alphabetical order (in English) of application administrator names. The register of RFID data constructs is a publicly available document, free of charge to all parties.

The register of RFID data constructs shall contain the following information:

a) name of the application administrator;

b) address as indicated on the application form;

c) the RFID data constructs assigned to the application administrator by the Registration Authority;

d) (if applicable) the type of table-driven encoding and the URL where the table can be freely obtained from the application administrator.

1) ISO maintains an online list of maintenance agencies and registration authorities relevant to its standards at http://www.iso.org/mara. Users are encouraged to consult this database for the most up-to-date information concerning maintenance agencies and registration authorities.

Annex A
(normative)

User considerations of RFID data constructs

A.1 User considerations of RFID data constructs

There are four primary RFID data constructs that are within the scope of this document. Each is fully specified in ISO/IEC 15961-3, which shall be referred to when drafting application standards. A short description of each data construct and specified responsibility for defining the particular data construct is provided in A.2 to A.5. Users are advised to check the RFID data constructs register[2)] for details of registered data constructs, including those assigned for particular classes of closed system application.

In addition, the data constructs may be presented in tables or use particular encoding schemes that are fully defined in ISO/IEC 15962. Such tables and encoding schemes need to be registered under the rules of this document. A short description of the types of table and encoding schemes is provided in A.6 and its subclauses, together with information about the responsibility of the application administrator when applying for registration.

A.2 Application Family Identifier

The purpose of the AFI is to ensure that RFID tags carrying data highly relevant for one application do not overlap, or clash, with those of another application. An application administrator can identify the need to distinguish RFID tags for a particular domain and scope. Full information on AFIs can be found in ISO/IEC 15961-3:2019, Clause 5.

A.3 Data format

The prime purpose of the data format is to provide a link between the Object Identifier structure of ISO/IEC 9834-1 and the application data, which can be in the form of a data dictionary or specification of a set of data elements.

A secondary purpose of the data format is to enable the Object Identifier to be truncated when encoded on the RFID tag, without the loss of uniqueness. The data format is encoded once as part of the system information, and because of the one-to-one mapping between the data format and the Root-OID, this does not need to be encoded for any data objects encoded on the RFID tag.

Full information on data format can be found in ISO/IEC 15961-3:2019, Clause 6.

A.4 Object identifier for the Unique Item Identifier

The encoding of a UII is supported in the data protocol standards (ISO/IEC 15961-1 and ISO/IEC 15962) and the air interface standards (ISO/IEC 18000). Generally, two methods are available:

— The UII can be encoded in a particular area of a partitioned memory.

— The UII can be encoded in, and accessed from, the first logical position in a generic memory structure.

Either method enables the UII to be accessed efficiently.

2) ISO maintains an online list of maintenance agencies and registration authorities relevant to their standards at http://www.iso.org/mara. Users are encouraged to consult this database for the most up-to-date information concerning maintenance agencies and registration authorities.

There are pre-existing Unique Item Identifier schemes that are already compliant with Object Identifiers as defined in ISO/IEC 9834-1. Further information is available on the RFID data constructs register available from the RA.

Full information on Object Identifiers can be found in ISO/IEC 15961-3:2019, Clause 7.

A.5 Object identifier for other item-attendant data

RFID for item management can require other item-attendant data to be encoded on the RFID tag, for example to provide instant access to data or to support the updating of data over time. Such data needs to be distinguishable from the UII and from other data elements, if more than one is encoded. The encoding of item-attendant data is supported in the data protocol standards (ISO/IEC 15961-1 and ISO/IEC 15962) and the air interface standards (ISO/IEC 18000) through the use of Object Identifiers. Full information on Object Identifiers can be found in ISO/IEC 15961-3:2019, Clause 7.

A.6 Other specific data constructs

A.6.1 General

There is a set of data constructs that may be used to achieve efficient encoding, but which might not be appropriate for all applications. Because of the technical aspects, their use shall conform precisely to rules defined in ISO/IEC 15962. In turn, this requires application administrators, those developing application standards and systems developers to understand the relevant parts of that standard. The specific data constructs are discussed in A.6.2 to A.6.6.

A.6.2 AFI declaring a Monomorphic-UII

There is a class of UII that is declared directly by the AFI without reference to a data format. A UII that is declared in this manner is defined as a Monomorphic-UII. A Monomorphic-UII shall either be the only encoded data in a dedicated UII memory bank, or be the only data element encoded on an RFID tag with a single encoding memory.

If the application standard intends to make use of a Monomorphic-UII, the relevant clause in ISO/IEC 15962 shall be used to ensure that the correct encoding scheme is selected and is specified in the application to enable the Monomorphic-UII to be properly registered to the rules of this document. A Monomorphic-UII may only specify one compaction scheme; this shall be declared as part of the application for registration of the AFI.

A.6.3 Mapping Tables for data constructs

The Object Identifier structure used as the basis for encoding and communicating data elements for ISO/IEC 15961-1 and ISO/IEC 15962 requires the Relative-OID to be presented as an all-numeric structure with some ISO/IEC 15962 encoding schemes. If an application already uses an alphabetic or alphanumeric data structure for identifying data elements, then a conversion mechanism shall be prepared to enable the application to make use of the RFID data protocol. An example of such a mechanism is for a mapping table to be constructed of the data dictionary identifier to an all-numeric Relative-OID value.

A.6.4 Data constructs and the Packed Object encoding schemes

The Packed Object scheme provides efficient encoding for any data selected from an established data dictionary. To implement Packed Objects, a table needs to be provided that is directly associated with a particular data format. Then it is necessary to select the encoding rule for each data element. The table needs to be provided irrespective of the current data element structure, i.e. it applies equally to a data dictionary with an all-numeric data element identifier as to one that uses alphanumeric or alphabetic codes.

