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Supply chain applications of RFID — Product tagging

Applications de chaîne d'approvisionnements de RFID — Étiquetage de produit

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing documents is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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 ISO documents 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 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).

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 Technical Committee ISO/IEC JTC 1/SC 31, *Automatic Identification and Data Capture Techniques,* Subcommittee WG 8, *Applications in AIDC*.

This third edition cancels and replaces the second edition (ISO/IEC 17367:2013), which has been technically revised.

The main changes compared to the previous edition are as follows:

— 8-bit encoding and decoding using the UTF-8 encoding set added.

— Outdated processes and information updated.

A list of all parts of the ISO/IEC 1736x 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 'Supply Chain' is a multi-level concept that covers all aspects of taking a product from raw materials to a final product, including shipping to a final place of sale, use and maintenance and, potentially, disposal. Each of these levels covers many aspects of dealing with products, and the business process for each level is both unique and overlaps other levels.

This document has been created in order to ensure compatibility at the physical, command and data levels with the four other documents, under the general title *Supply chain applications of RFID*. Where possible, this compatibility takes the form of interchangeability. Where interchangeability is not feasible, the documents within this suite are interoperable and non-interfering. The documents within the complete series of Supply chain applications of RFID include:

— ISO/IEC 17363, *Supply chain applications of RFID — Freight containers*

— ISO/IEC 17364, *Supply chain applications of RFID — Returnable transport items (RTIs) and returnable packaging items (RPIs)*

— ISO/IEC 17365, *Supply chain applications of RFID — Transport units*

— ISO/IEC 17366, *Supply chain applications of RFID — Product packaging*

— ISO/IEC 17367, *Supply chain applications of RFID — Product tagging*

These documents define the technical aspects and data hierarchy of information required in each layer of the supply chain. The air-interface and communications protocol standards supported within the supply chain applications of RFID documents are ISO/IEC 18000. Commands and messages are specified by ISO/IEC 15961 and ISO/IEC 15962. Semantics are defined in ISO/IEC 15418 and syntax is defined in ISO/IEC 15434.

Supply chain applications of RFID — Product tagging

1 Scope

This document defines the basic features of RFID for use in the supply chain when applied to product tagging. In particular it:

— Provides specific recommendations about the encoded identification of the product.

— Makes recommendations about additional information about the product on the RF tag.

— Makes recommendations about the semantics and data syntax to be used.

— Makes recommendations about the data protocol to be used to interface with business applications and the RFID system.

— Makes recommendations about the air interface standards between the RF interrogator and RF tag.

This document only covers the tagging of products and does not address a products packaging.

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.

ANS MH10.8.2, *Data Identifiers*

GS1 *EPC Tag Data Standard (TDS)*

ISO 8601, *Data elements and interchange formats — Information interchange — Representation of dates and times*

ISO/IEC 10646, *Information technology — Universal Coded Character Set (UCS)*

ISO/IEC 15418, *Information technology — Automatic identification and data capture techniques — GS1 Application Identifiers and ASC MH10 Data Identifiers and maintenance*

ISO/IEC 15434, *Information technology — Automatic identification and data capture techniques — Syntax for high-capacity ADC media*

ISO/IEC 15459 (all parts), *Information technology — Automatic identification and data capture techniques — Unique identification*

ISO/IEC 15961, *Information technology — Radio frequency identification (RFID) for item management — Data protocol: application interface*

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

ISO/IEC 17364, *Supply chain applications of RFID — Returnable transport items (RTIs) and returnable packaging items (RPIs)*

ISO/IEC 18000-3, *Information technology — Radio frequency identification for item management — Part 3: Parameters for air interface communications at 13,56 MHz*

ISO/IEC 18000-63, *Information technology — Radio frequency identification for item management — Part 63: Parameters for air interface communications at 860 MHz to 960 MHz Type C*

ISO/IEC 19762, *Information technology — Automatic identification and data capture (AIDC) techniques — Harmonized vocabulary*

ISO/IEC 20248, *Information technology — Automatic identification and data capture techniques — Data structures — Digital signature meta structure*

ISO 21067, *Packaging — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 17364, ISO/IEC 19762 and the following apply.

For the purposes of this document, hexadecimal characters are represented as 0xnn, where “0x” is the hexadecimal indicator and “nn” is the hexadecimal value.

For the purposes of this document, the representation of the tags Memory Banks (MB) 00_2, $MB01_2$, $MB10_2$ and $MB11_2$ shall be represented as MB00, MB01, MB10, and MB11.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Concepts

Figures 1 and 2 give a graphical representation of supply chain layers. They show a conceptual model of possible supply chain relationships - not a one-for-one representation of physical things. Although several layers in Figure 2 have clear physical counterparts, some common supply chain physical items fit in several layers depending on the use case. For example, as shown in Figure 2, a repetitively used pallet under constant ownership would be covered by ISO/IEC 17364 as an RTI; a pallet that is part of a consolidated unit load would be covered by this document as a transport unit; and a pallet that is integral to a single item would be covered as product packaging by ISO/IEC 17366.

The term “supply chain layers” or levels, is a multi-level concept that covers all aspects of taking a product from raw materials to:

— A final product

— To shipping

— To a final place of sale, use, maintenance

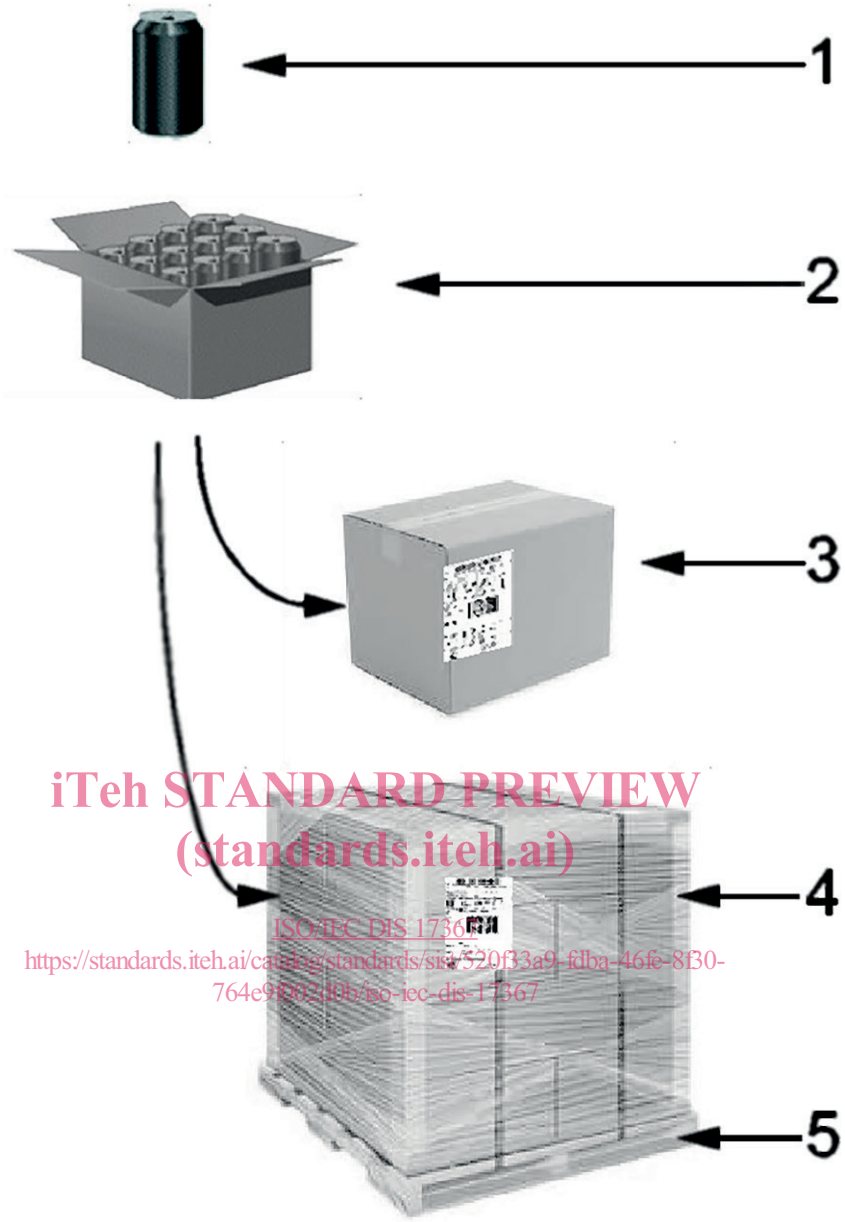
— Potentially, returned goods and disposal

Each of these levels covers many aspects of dealing with products and the business process for each level is both unique and overlaps other levels.

The Item Level through Freight Container Level layers are addressed within the suite of standards for “supply chain applications of RFID” and are intended to enhance supply chain visibility. The Movement Vehicle Level is the purview of ISO/TC 204/WG 7, and is not a part of this series of standards.

Layer 0, the Product level layer in Figure 2, is the subject of this document.

Product Level tags can be distinguished from following, or preceding, layer tags by the use of a Group-Select methodology contained in the RFID interrogator/reader. This Group-Select function allows the interrogator, and supporting automated information systems (AIS), to quickly identify Product Level tags.



Key

1 Primary packaging – consumer packaging – (product)
2 Secondary packaging – outer packaging – (product package)
3 Tertiary packaging – transport packaging – (transport unit)
4 Tertiary packaging – unitized transport packaging – (transport unit)
5 Pallet – (potentially returnable transport item – RTI)

Figure 1 — Packaging

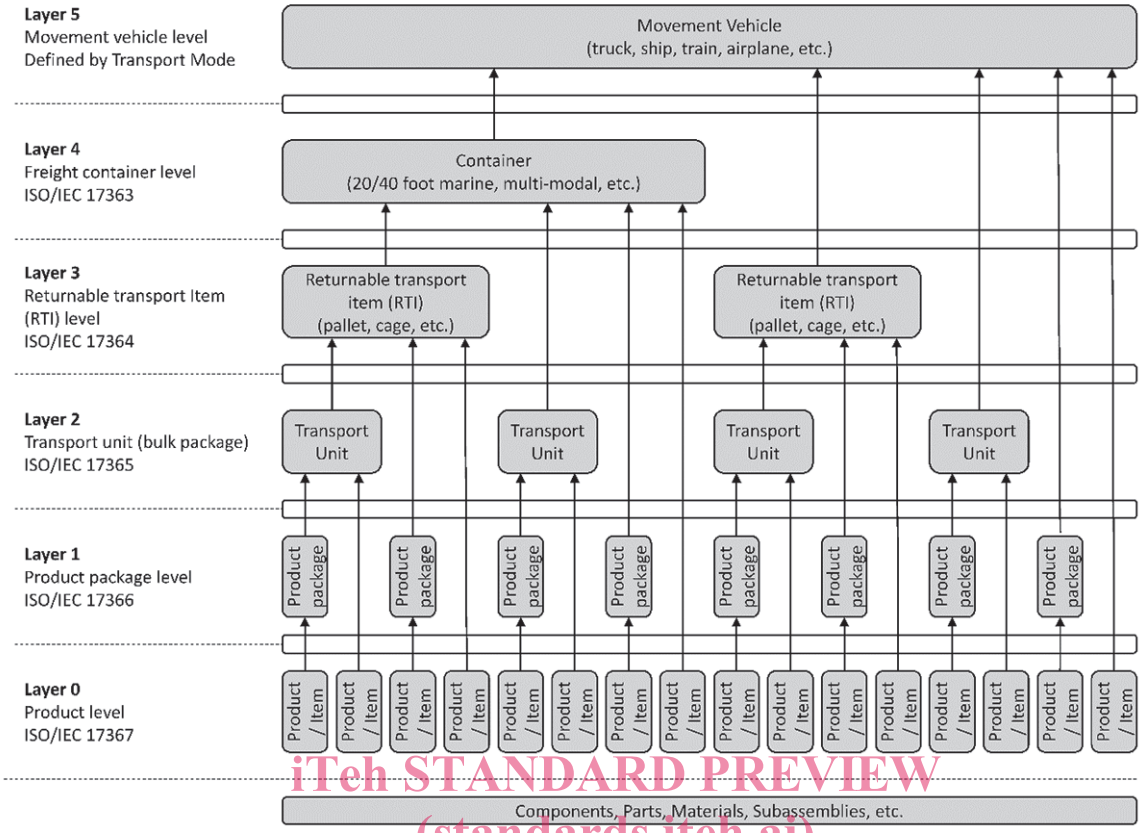


Figure 2 — Supply chain layers

5 Unique item identifier

5.1 General

Unique item identification is a process that assigns a unique data string to an individual item, or in this case, to an RFID tag that is associated to the item. The unique data string is called the unique item identifier. Unique item identification of items allows data collection and management at a granular level. The benefits of having granular level data are evident in such areas as maintenance, retail warranties and enabling electronic transactions of record. The benefits are only possible if each tagged item has a unique identity.

Items that are not uniquely identified would not normally be tagged at the item level. Items to which unique item identifiers have been assigned are said to be serialized items. Low cost consumable items would normally be tagged at the package, or higher, level.

The unique item identifier (UII) provides granular discrimination between like items that are identified with RFID tags or barcodes. The Unique Tag ID (as defined by ISO/IEC 15963-1) is a mechanism to uniquely identify RFID tags and is not the unique product identifier defined in this document.

The minimum data elements required for unique identification are an issuing agency code (IAC), a unique enterprise identifier (Company Identification Number, CIN) assigned by the IAC and a serial number (SN) that is unique within that enterprise identifier.

The unique identifier of ISO/IEC 15459 provides identification schemes for various layers of the supply chain, from Layer 0 (products) up to Layer 3 (returnable transport items).

5.2 UII data elements

Unique identification is provided by the minimum of the following three components:

1. Issuing Agency Code (IAC)
2. Company Identification Number (CIN)
3. Serial Number (SN)

The registration authority, as defined by ISO/IEC 15459, assigns the IAC. The IAC assigns the CIN. The company identified by the CIN assigns the serial number (SN). The serial number component can be composed of multiple parts – but in all cases must be a unique identifier within the CINs domain.

When using ISO/IEC 15418, the unique identity, as defined by IAC CIN SN, is preceded by an applicable MH10.8.2 Data Identifier (DI). Any applicable Data Identifier from ISO/IEC 15418 is allowed.

It is strongly recommended that once the UII has been constructed and encoded on an RFID tag that it be write-protected.

5.3 Data Carrier

The data carrier / air interface shall be ISO/IEC 18000-63 or ISO/IEC 18000-3, Mode 3.

An ISO/IEC 18000-63 or ISO/IEC 18000-3 Mode 3 tags' memory is structured in three user-accessible memory banks;

1. MB01 (UII); for the purpose of this specification, contains the ISO/IEC 18000-63-defined constructs of the Protocol Control bits (PC), optional Extended PC bits (XPC) and the Unique Item Identifier (UII).

   1.1. The PC bits contain flags to indicate the numbering system of the tag to be either ISO or GS1, and the existence of XPC bits and MB11.

      1.1.1. When ISO is indicated, the PC bits contain an Application Family Identifier (AFI) that indicates the data family of the UII.

         1.1.1.1. The AFI is managed by the directives of ISO/IEC 15961 and listed in the ISO/IEC 15961 Data Constructs Register.

   NOTE MB01 may include additional information, like tag and item flags, sensor data, and other item information as indicated by the PC Bits.

2. MB10 (TID); identifies the tag according to ISO/IEC 15963-1.
3. MB11 (USER); contains user information as specified by the AFI and/or the Data Storage Format Identifier (DSFID). MB11 is optional.

As defined by the AFI, the UII format may be specified by a DSFID. The DSFID is specified and managed by the directives of ISO/IEC 15962 and listed in the ISO/IEC 15962 Data Constructs Register.

5.4 Formats and encoding

5.4.1 General

The following sub-clauses specify the unique item identifier methodologies that are allowed.

5.4.2 GS1 EPC bitstream encoding

For GS1 EPC encoding, the numbering system identifier toggle, shown as Standard toggle (T) in Figure A.2, shall be set to 0_2 (GS1). The UII shall then be an electronic product code (EPC) as specified by GS1 TDS.

5.4.3 ISO/IEC 15418 (ANS MH10.8.2) DIs: Monomorphic 6-bit UII encoding

The numbering system identifier toggle, shown as Standard toggle (T) in Figure A.2, shall be set to 1_2 (ISO).

An ISO/IEC 15418-based UII, consisting of an applicable DI and item information, shall be encoded according to the AFI selected, as that AFI is defined by the ISO/IEC 15962 appointed registration authority.

NOTE AFIs "0xA6", "0xA7" and "0xA8" that currently indicate HAZMAT, will be requested to be removed from use, and potentially reassigned. The XPC HAZMAT flag shall be used to denote HAZMAT material.

The first DI in the UII datastream shall be globally unique and contain the IAC, CIN and SN. It is strongly recommended that only one DI, and its data, be used in the UII datastream. In all cases, the UII shall be defined by the first DI in the UII datastream.

When used, multiple DIs shall be separated by the control character $^{G}_{S}$ (0x1D).

The messages should be terminated with the control character $^{E}O_{T}$ (0x04).

See Annex A for examples.

5.4.4 ISO/IEC 15418 (ANS MH10.8.2) DIs: Monomorphic UTF-8 8-bit encoding

The numbering system identifier toggle, shown as Standard toggle (T) in Figure A.2, shall be set to 1_2 (ISO).

The UII is encoded using UTF-8 encoding as specified by an appropriate AFI as shown in the Data Constructs Register.

The first DI shall be globally unique and contain the IAC, CIN and SN. It is strongly recommended that only one DI, and its data, be used in the UII datastream. In all cases, the UII shall be defined by the first DI in the UII datastream.

When used, multiple DIs shall be separated by the control character $^{G}_{S}$ (0x1D).

The messages should be terminated with the control character $^{E}O_{T}$ (0x04).

Optional data stored in MB11 shall use an AFI-defined, ISO/IEC 15961-registered data format.

See Annex A for examples.

5.4.5 DSFID for ISO/IEC 15434 messages

See the Data Constructs Register of ISO/IEC 15961 for Data Format 03 and 13 definitions, and for the specification for DSFIDs.

5.4.6 UII bitstream encoding

The numbering system identifier toggle, shown as Standard toggle (T) in Figure A.2, shall be set to 1_2 (ISO).

The UII is encoded as a bitstream, as specified below, identified with the appropriate AFI, as registered in the ISO/IEC 15961 Data Constructs Register.

