E.D.C.
Eurodata Council

Sapporo Emblem

ISO Report AIDC 2016

Automatic Identification & Data Capture

Report on continued standardization of Bar Code, RFID & Data Communication

Fig. 1) ISO/IEC JTC 1/SC 31 Meeting 2016, host: JAPAN

Flags of member Nations of ISO/IEC/JTC 1/SC 31 (partial selection)

Australia	Austria	Belgium	China	Canada	Switzerland	Germany	Finland	France
Japan	Singapore	S. Africa	S.Korea	Sweden	NL	Russia	UK	USA

.. and contributing organizations like

AIM	**CEN TC225**	**NATO**	**EDC**	**ETSI**	**GS1**	**IATA**	**HIBC**	**ISO TC122**	**ISO SC17**	**ITU**	**UPU**

and other contributors and liaisons such as JTC1/SWG10, IEEE, etc.

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in cooperation with AIM, DIN, EDIFICE, EHIBCC and liaisons

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AIDC - Automatic Identification & Data Capture

Report on the continued standardization of Bar Code, RFID & Data structures

This report is intended to supply information on further developments of AIDC technologies and applications. The report is focusing on the 22nd ISO/IEC JTC 1/ SC 31 plenary meeting in Sapporo, Hokkaido (Japan), but will include highlights of AIDC activities as subject of other standardization efforts and actual application developments in industries and healthcare.

- **AIDC as a strategic module** for business development
  AIDC for Healthcare - Regulators discover AIDC as best for patient safety, the new regulations for medicinal (pharmaceutical) products include barcode
- **20th Anniversary** - ISO/IEC JTC 1/Sub Group 31 covering AIDC since 20 years
- **The structure of ISO/IEC JTC 1/SC 31** and the Working Groups activities
- **Highlights** of AIDC development
- Rectangular **Data Matrix "DMRE" becoming ISO/IEC°21471**, Ultracode AIM standard
- **New - Authenticity and security** for Barcode & RFID
- AIDC links items to systems – **Quick IoT solution**
- **AIDC projects other than ISO**, e.g.IEC 62090, CEN eID Plate, DIN 16589 P2P
- Attachments - **Quick guide, list of Issuing Agencies, DigSig illustration** (Annex 4)
- **List of AIDC Standards** (Annex 5)

R, a strategic AIDC module

Fig. 3) ISO/IEC SC 31 AIDC: The delegates decide for comprehensive solutions

Introduction, AIDC as a strategic module for business and business development

Barcode became known in the 70th/80th as an ideal tool to speed up data capture and documentation processes and to increase data accuracy. AIDC delivers "Real Time" information with the shipment, supporting and backing up Electronic Data Interchange – EDI.
Today AIDC has got a key strategic role as a module in business communication where item management is involved. In short, AIDC cannot be neglected nor avoided neither in industries and distribution nor in healthcare or administration areas. Governments discovered that AIDC is becoming an unavoidable aid not only to get necessary data accuracy e.g. for identification of persons by passports (OCR & RFID) or unique identification of goods, but also for development of markets by technology. AIDC belongs to IT as a module in it and for it.
IT and data communication are seen as driving force to develop new business by Digital Agendas. Internet of Things (IoT), Machine to Machine (M2M) communication, INDUSTRY 4.0 (I4.0) are terms standing for such horses supported by governments and driven by industries. The ISO Technical Board recognized the trend and opened an I4.0 steering committee with participation of countries like China, France, UK, Japan, Germany and IoT groups like JTC 1/WG 10 IoT, ISO/TC 108 Automation and IEC/SG 8 Smart Manufacturing. It is the "digital market" where AIDC and IoT play a significant role. Document, Brussels, 6.5.2015 COM(2015) 192 final, states:

"*The global economy is rapidly becoming digital. Information and Communication Technology (ICT) is no longer a specific sector but the foundation of all modern innovative economic systems. The Internet and digital technologies are transforming the lifes we live, the way we work – as individuals, in business, and in our communities as they become more integrated across all sectors of our economy and society."* In fact, AIDC represents a small module in the digital world but is an indispensable part of it wher ever item to system communication is to be managed.

Fig. 4) UDI-Code in ISO/IEC 16022 Data Matrix

AIDC for Healthcare
Regulators discover AIDC as best for patient safety and logistical enhancement.
Since the development of the Healthcare Bar Code (HIBC) in 1984 it took a while that Barcode became the general means in that area like in many other areas of industries and distribution where data had to be captured quick and safely. May be the appeal of Jean-Claude Juncker on May 5, 2015 speeded up the developments. In fact, specifically for Healthcare the regulators discovered that AIDC will increase patient safety and logistical accuracy. Accordingly the International Medical Device Regulators Forum (IMDRF) with members like Food and Drug Administration (FDA) of the US, the European Commission of the EU and many other national members around the globe started the international project UNIQUE DEVICE IDENTIFICATION (UDI). UDI includes AIDC for unique product marking/labeling and of corresponding data in central data bases. UDI was put to law in the US in 2013 already where FDA became the executive arm for controlling it. Any Medical Device entering in the US market is subject of the legal requirements to mark medical devices with Barcode (sample see Fig. 5). The project is proceeding in Europe as well. It passed the European Parliament and the European Commission is preparing the legal requirements in detail. Following Turkey and the US the UDI law is expected to start in Europe end of 2016. The change from previous practices is, that unique marking/labeling by AIDC is not a voluntary matter anymore but a legal requirement *(for more information see www.fda.gov/UDI or www.hibc.de/de/udi.html)*.

Fig. 5) Health Industry Bar Code – HIBC since 1984 – today UDI conforming

The project "Unique Device Identification – UDI" of the European Union indicates how serious such statements are taken. Here AIDC and its standardization are keys to make it happen by providing the language to enable communication between individual items and systems automatically, e.g. medical devices to data bases for purposes of tracking and tracing (see below).

The new European regulation for medicinal products with serialized ISO/IEC 16022 Data Matrix.
The regulation for medicinal products has been processed slightly faster than the European UDI project. The COMMISSION DELEGATED REGULATION (EU) 2016/161 was released October 2. 2015. It includes the marking of product packages uniquely by serialized ISO/IEC 16022 Data Matrix but also a system for linking Pharmacies to a database automatically for verification check of the Serial Number (SN). In addition it includes safety features for recognizing opening the package (tamper proof). This are means against counterfeiting but serialization is also a means for improving logistics and handling the medicinal products in pharmacies as well as in hospitals. Nationally recognized support organizations adjust their systems according to the new regulations like the German national system has been adjusted from the previous "PZN" to the "Pharma Product Number-PPN" (see Fig. 6 PPN encoded in DMRE). The unique "IFA-Coding-System" is providing capacity for any other national drug identification system in the world inviting other nations to join. *(see http://www.ifaffm.de/en/ifa-codingsystem.html)*

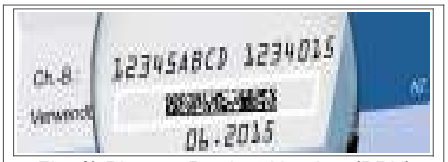


Fig. 6) Pharma Product Number (PPN) carried by DIN 16587 DMRE

AIDC standardization on ISO level for global functionality across industries

It was stated that were ever data are to be captured automatically, quick and safe, AIDC is getting a key role globally avoiding manual entry and errors. Standards are the prerequisite to get systems running. Here is the place for ISO with the network of all the connected national normalization institutes. ISO standardization enables cross company, cross country and worldwide application of AIDC technologies for common benefit for all business partners.

Fig. 7) ISO Emblem and AIDC symbols

20th Anniversary

ISO/IEC JTC 1/Sub Group 31 covering AIDC since 20 years

ISO/IEC JTC 1/SC 31 (in short "SC 31") celebrated the 20th anniversary.
The committee became appointed by the Joined Technical Committee 1 of ISO and IEC in 1996 to take the responsibility for AIDC technologies. This includes standardization of Optical Readable Media (ORM) with Barcode 2D and OCR as well as RFID technologies but also the data structures for the communication to the computing equipment. Their are 45 countries on the list of SC 31 as active members and observers. Between 1996 and now 116 AIDC standards have been published. Some are already in the review process and new projects are in the pipeline.

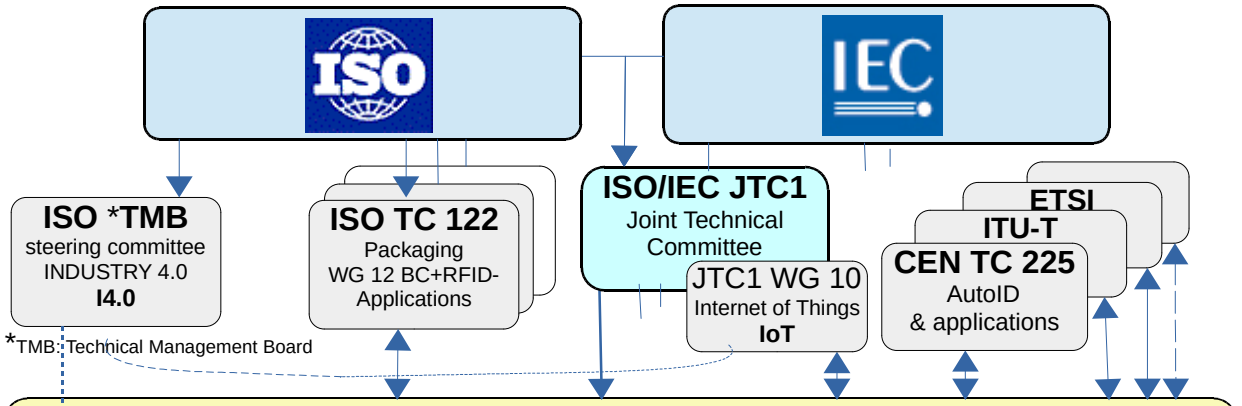
Fig. 8) Dan Kimball, Chair SC31(r) and Eddy Merill (l), SC 31 secretary

The acting Chairman of SC 31 is Mr. Dan Kimball (Fig. 8) assisted by his secretary Eddy Merill. The work is undertaken by experts delegates from national standardization institutes and liaison organizations. The projects are dedicated to responsible working groups (see table 1). For taking new work items a simple rule applies: a minimum of 5 nations shall nominate one expert each for active contribution to a project requested by a member. Other ISO committees and industry groups take the technology standards creating applications with it, like ISO TC 122 developed the application standards for bar code and RFID applications for the logistical levels in supply chains. The co-founder CEN TC 225 is now liaison committee maintaining the European 3-language versions of AIDC standards. Still there are European Standards (EN) in development for specific projects, e. g. the EN for the “Electronic Identification Plate”. Nevertheless the ISO level is the highest level possible to get standards published worldwide. National standardization institutes send experts from industries, distribution, healthcare and administration to the meetings for moving the projects forward. The ISO standards are referenced in industrial sectors standards and become part of it as e.g. in the “Global Transport Label (GTL)” of the Automotive Industries, the “Serial Shipping Container Code (SSCC)” of GS1, the “Set Label” of the Electronic Industry (EDIFICE), just to mention some of many examples. Even governmental entities like Food & Drug Administration (FDA-US) recognize the key role of the ISO standards by referencing to ISO/IEC 15459 Unique Identification, seen with the project “Unique Device Identification (UDI). For a more comprehensive JTC1 SC31 History report see: https://jtc1historyblog.wordpress.com/sc-31/

The structure of ISO/IEC JTC 1/SC 31

SC 31 is bound to the structure of the Joint Technical Committee JTC1 of ISO and IEC. Table 1 illustrates how SC 31 is embedded within the network of standardization bodies.

Table 1) Structure of SC 31 embedded in the network of ISO and IEC



ISO/IEC JTC1/SC 31

Automatic Identification and Data Capture Techniques

Chair: Dan Kimball

WG 1 Sprague Ackley	**WG 2** Toshihiro Yoshioka	WG 3	**WG 4** Josef Preishuber-Pflügl	*WG 5	*WG 6	*WG 7
Data Carrier	Data structures	Con-formance	Radio communications	RTLS	Mobile Item Identification	Security
Symbol-specifications + conformance, e.g. Data Matrix, QR	*Data structures & rules for unambiguous identification*	*Moved to WG 1 and to WG4*	*RFID, Real time Location Systems (RTLS), Security*	*Moved to WG 4*	*Work moved to WG 2 and to WG 4*	*Moved to WG 4*

National Standardization Institutes

AFNOR	ANSI	BSI	DIN	JISC	KATS	NEN	SABS	SAC	SCC	SIS	etc.	...	..

**Note: SC 31 restructured by moving the work of WG 3, 5, WG 6 and WG 7 to WG 1 and 4.*

The 22nd SC 31 meeting sequence June 6 to 10, 2016 on AIDC standardization

The 22nd SC 31 Plenary meeting in Sapporo attracted experts from all parts of the world, an ideal occasion not to have the Plenary meeting only but to use the location for working group and ad hoc meetings as well. This year the meeting schedule was:

- Monday, June 6 AM: Working group 2 Data structures, PM: WG 4/SG1 RFID Data structures
- Tuesday, June 7 AM: WG4/Sub Group 6 RFID Performance, PM: Working Group 4 RFID
- Wednesday, June 8: Convenors and Head of Delegation (HoD) meetings
- Thursday, June 9: SC 31 Plenary meeting
- Friday, June 10: SC 31 Plenary meeting continued and resolutions.

The full plenary meeting was chaired by Dan Kimball assisted by the secretary Eddy Merill and Chuck Biss, the previous chairman. Conveners of the Working groups reported about the progress of the projects, liaison officers reported about co-operational issues and the national delegates reported about national highlights on AIDC in their region. SC 31 produces the “Resolutions” as the meeting results including further action items but SC 31 does not produce any meeting report. The report you are reading has been written from the prospective of the author with the intention to allow insight into discussion points, actual AIDC issues and further developments.

Next SC 31 plenaries:
2017 Stockholm Sweden
2018 Americas or South Africa
2019 Asia/Pacific

SC 31 restructuring process for preparation for AIDC applications

Fig. 9) Sprague Ackley (l) and Dan Kimball (r) in discussion

In 2015 SC 31 decided for optimization of the group structure. The restructuring process of SC 31 has been finalized right now as shown in table 1. The work on technology standards will be concentrated to 3 working groups only instead of 7. Convenors are for WG1 Data Carriers Sprague Ackley (Fig. 9) USA (Honeywell), for WG2 Data Structures Toshihiro Yoshioka (Fig.12), Japan (AI Research Institute) and for WG 4 RFID Josef Preishuber-Pflügl (Fig.14), Austria (CISC Semiconductor GmbH). To cover the open position as editor for the 5-language vocabulary of AIDC ISO/IEC 19762 a new editor has been appointed: Tomohiro Watanabe, Japan. After Craig Harmon, the first editor of the vocabulary, passed away, Dan Kimball took over the responsibility preliminary. Now the job is handed over to Tomohiro Watanabe, an experienced expert in AIDC delegated by the AutoID company DENSO Wave, Tokyo.

New working area: AIDC applications

SC 31 is recocnized as strong on standardization of the techniques but the group felt SC 31 could offer even more having got the expertise for application of AIDC technologies as well. At the plenary meeting it was discussed how to prepare the committee for potential future tasks of developing AIDC application standards in addition to the technology standards like CEN TC 225 does (e.g. AIDC application standard for the “Electronic Identification Plate”). Resolution 19 of the Plenary documented the consideration of a new work group related to the application of AIDC standards (e.g. ISO/IEC JTC 1/SC 31/WG 8):

“ISO/IEC JTC 1/SC 31 resolves to establish an ad hoc to complete the necessary actions to create a new work group and resolves to appoint Mr. Dan Kimball (Chair), Mr. Mikael Hjalmarson, Mr. Henri Barthel, Mr. Eddy Merrill, Mr. Albertus Pretorius, Mr. Kazuo Kobashi, and Mr. Chuck Biss to the Ad Hoc for the next plenary period. This group is requested to complete its work nolater than October 1, 2016.”

Fig. 10) SC31 discussing AIDC applications

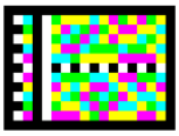
Working Group 1 – Data Carrier, Convener Sprague Ackley, USA

WG1 is the responsible working group for Optical Readable Media (OMR) including linear symbols, 2d symbols, OCR and quality measurement specifications. All major bar codes and 2d-symbols are under management of WG1, e. g. ISO/IEC 16388 Code 39, ISO/IEC 15417 Code 128, ISO/IEC 16022 Data Matrix, ISO/IEC 18004 QR Code. The latest project was the ISO/IEC PRF 30116 Optical Character Recognition (OCR-B) quality testing, a joined development with SC 17/WG 3 (Card technologies). The standard is specifically required for governmental applications like OCR B on passports and ID Cards. Sprague Ackley reported about the progress of the Direct part marking quality guidelines ISO/IEC 29158, update of ISO/IEC 15438 PDF bar code and on Han Xing Code and on ISO/IEC 21741 DMRE (see Fig. 11 below).

Fig. 11) Extended Rectangular Data Matrix (DMRE) of 1.6 mm height carries globally unique serialized product reference

ISO/IEC 21471 Extended Rectangular Data Matrix (DMRE).

DMRE was developed by initiative of a consortium of industries and healthcare to enhance applications of the Health Industry Bar Code "HIBC", the IFA Coding System "PPN" and industries applications with demand for codes of smallest height. DMRE was pre-published as AIM Standard and DIN 16587 and is ready for immediate use. ISO/IEC°21471 will enable global applications where ever existing 2d-code sizes are not small enough. Equipment suppliers are encouraged to update the size tables of regular Data Matrix for immediate implementation. The job is easy, the benefit is uge.
For more information see *www.**dmre**.**info**/*



ULTRACODE next
Ultracode belongs to the 2-dimensional codes, where the 3rd dimension is the color. Ultracode was developed by Clive Hohberger, one of the appointed AIDC expert of the "ADC100" club. Ultracode has been announced as published as AIM Standard July 13, 2016. Next possible stage of Ultracode would be adoption as ISO/IEC standard.

Working Group 2: Data Structures

Convener Toshihiro Yoshioka, Japan

Fig. 12) Toshihiro Yoshioka (l), Kazuo Kobashi (m) and Mikael Hjalmarson (r)

Working Group 2 is responsible for data structures, syntax and communications. All key standards for ensuring the uniqueness of Barcode & RFID are under the responsibility of WG 2. At the top of the projects stands "ISO/IEC 15459 Unique Identification" with 6 parts for rules and definitions of uniquely identifying Items (see below). The standard defines the hierarchy of unambiguity by shared responsibility for the parties involved. The hierarchy is top down: ISO sets the rules, the appointed Registration Authority (RA) registers Issuing Agencies (IA) and IA registers a CIN (Company ID Number) for the labeler (see Annex 1).
Periodically ISO/IEC 15459 received the regular maintenance update as the other standards as well like ISO/IEC 15418 GS1 Application Identifiers & ASC MH10 Data Identifiers, ISO/IEC 15434 Syntax for High Capacity Media and ISO/IEC 29161 Digital Identification for IoT (see next page). Appointed editor is Mikael Hjalmarson, ERICSSON, HoD Swedish Standards Institute (SIS) and Chairman of EDIFICE (Fig. 12 (r). One more project has been assigned to WG 2, the Digital Signature meta structure ISO/IEC WD 20248 (see separate chapter "Highlights" and Annex 4).

ISO/IEC 15459 Unique Identification

ISO/IEC 15459 is the key standard for achieving global uniqueness cross company, cross industries and world wide. The six parts of ISO/IEC 15459 are:

- **Part 1: Individual transport units** describes how to identify transport items uniquely
- **Part 2: Registration procedures** set the rules for the "Registration Agency" for assigning unique Issuing Agency Codes (IAC)
- **Part 3: Common rules** describe how unique IDs are constructed by IAC, CIN and item reference
- **Part 4: Individual products & product packages** defines unique identifiers at product level
- **Part 5: Individual returnable transport items (RTI)** is focusing on uniqueness for containers
- **Part 6: Groupings** specifies rules for a unique string of characters for the identification of groupings of products, product packages, transport units and items.

ISO/IEC 15459-2 REGISTER for ISSUING AGENCY CODES
*ISO/IEC 15459, part 2 outlines the obligations and the function of the Registration Agency (RA) responsible for maintenance of the IAC Register and the obligations of the Issuing Agencies. The appointed RA is the Industry Association AIM, succeeding the former RA, the Netherlands Normalization Institute (NEN). The IAC Registry is publicly available via this link:
→ *www.aimglobal.org/?Reg_Authority15459*

**Note: The Register dated 2016-07-12 included 39 registered Issuing Agency Codes (see Annex 3). The Issuing Agency GS1 is issuing numeric CINs for use in conjunction with the ISO/IEC 15418 GS1 Application Identifiers, the other 38 Issuing Agencies issue numeric or alphanumeric CINs for use in conjunction with ISO/IEC 15418 ASC MH10 Data Identifiers.*

The standard ISO/IEC 15418 GS1 Application Identifiers (AIs) and ASC MH10 Data Identifiers (DIs) and Maintenance jointly with ISO/IEC 15459 belong to the base standards for AIDC applications. It does not include the details neither on AIs nor DIs but it refers to the committees where the lists of identifiers are hosted each for the ASC MH10 Data Identifiers and for the GS1 Application Identifiers. The standard received a revision for updating the new address and link to the Material Handling Institute which has taken over the maintenance for the ASC Data Identifiers (see box "New ASC MH10 Data Identifiers").

NEW ISO/IEC 15418 ASC Data Identifiers (DIs)
ISO/IEC 15418 delegated the maintenance of the ASC Data Identifiers to the ANS MH10.8.2 DI Maintenance Committee (DIMC). The chairman is Bill Hoffman, HOFFMAN SYSTEMS, successor of Craig Harmon, there are 9 DIMC members as delegates from different market sectors and countries. Maintenance means to answer requests from the business areas of industries, healthcare, administration and distribution for new ASC Data Identifiers. A number of new DIs have been approved under the lead of Bill Hoffman:
12E Packing material and 13E Moister Sensitivity Level
27Q to 31Q for monetary values, discounts tax
52P Color of an item
30B Packaging Item Number for the packaging material
31B Global Unique Packaging Number.
30B and 31B is for identifying the packaging item used when packing products and packages
5R Data in the format and symantic of a responsible party identified by a ISO/IEC 15459 CIN
6R Digital-Signature for AIDC according ISO/IEC 20248
Latest application:
+ ASC DI for Data & format of Reverse Logistics Ass. [nN]

The DIs are listed in the document ANS MH10.8.2 ASC Data Identifiers and GS1 Application Identifiers", hosted by the Material Handling Institute (MHI) Charlotte, NC, USA
The link to the list is: http://www.mhi.org/standards/di

ISO/IEC 29161 Unique identification for IoT
AIDC links items to the Internet
Physical Items become live in the digital world by its unique name. This unique name is the reference where ever an item corresponds with data processing systems directly, through IoT or cloud. Items can be products, packages, transport units, containers, but also equipment, sensors, etc. The unique names of the items are carried by AIDC media like Barcode and/or RFID for automatic identification at any time and anywhere. The item names are defined by the key standard "ISO/IEC 15459 Unique Identification" for worldwide uniqueness and interoperability (see Annex 1). To meet the specific requirements of the digital world an "add on" to ISO/IEC 15459 has been developed by WG2. This is "ISO/IEC 29161 Information technology -- Data structure - Unique identification for the Internet of Things". It includes not only unique data constructs of items in digital format but also unique numbering schemes of other nature like being originated purely electronically, e.g. by sensors. Sensors send their digital identity in conjunction with transmitting specific values and measurement results. Following the very efficient scheme of ISO/IEC 15459 and its registry of Issuing Agency Codes (IAC) the 29161 defines a list of "BINARY Issuing Agency Codes - BIACs" as digital interpretation for continued application of the existing ISO/IEC 15459 IAC schemes just in a different notation. Editor of both standards is Mikael Hjalmarsson, Sweden.

Working Group 4, RFID
Convener Josef Preishuber-Pflügl, Austria (Firg. 14)


Bild 14) Josef Preishuber-Pflügl

WG 4 is responsible for the technological ISO/IEC standards for RFID. The RFID standards of the ISO/IEC 18000-XX series are building the base for implementing RFID technology in the markets. This includes the standards for Air Interfaces Low Frequency (LF), High Frequency (HF), Ultra High Frequency (UHF) and Microwave jointly with the relevant standards for conformance and data protocols. In the course of optimizing SC 31, the projects of the WGs 5, 6 and 7 will now be included in WG4 together with Crypto suites ISO/IEC 29167-X (10 to 22), Crypto suite conformance ISO/IEC 19823-X,

Fig. 13) ISO/IEC 29160 RFID Emblem

Air interface conformance ISO/IEC 18047-X and test methods for RTLS ISO/IEC 24769. The Data Constructs Steering Committee of WG 4 is responsible for handling registration of Application Family Identifiers (AFI). *AFIs identify application relevant categories (families) of RFID Tags data content, e. g. application of RFID for products or transport units conforming to the RFID application standards ISO 17363 to 17367. Other AFIs indicate application of card technology, RFID on Air baggage and containers (IATA), library books (EDItEUR) or on Blood products (ISBT). The registered AFI values being under the responsibility of SC 31 are listed in the standing document ISO/IEC 15961-2 Data Construct Register accessible via the SC 31 internet page. The latest AFI was assigned to applications using ISO/IEC 20248 Digital Signature. *(The Data Constructs Steering Committee of WG 4 assigned for RFID tag contents with DigSig protection the hex value for the AFI: 0x92 and for the relevant OID: 1 0 20248.)*

**Note: Application Family Identifiers (AFIs) of an ISO/IEC 18000-63 or 18000-3 M3 tag permit to separate tags among others in a given application so that the interrogator only talks to those tags having the application relevant AFI being requested, hence allowing a quicker data capture. AFIs are also used for "filtering" specific RFID tagged objects like filtering just baggage to pass a specific RFID gate and to stop any other objects at this gate like product packages or other tagged items. Where currently the maintenance with the Data Constructs Steering Committee, chaired by Paul Chartier, according to WG 4 the responsibility shall move to an associate Registration Agency for AFIs. The plenary resolves to pass it to AIM: "SC31 Secretariat to request AIM Inc. provide the operating procedures for the registration authority for ISO/IEC 15961-2 by 15 September 2016".*

Fig. 15) DigSig project editor Bertus Pretorius discussing 20248 features with Rainer Schrundner, Steyn Geldenhuis, Dick Fischer, Ehara Masaki

Highlights of AIDC development

Authenticity and security for Barcode & RFID

It's time not to consider AIDC carrier only but to look at security of the data information in it as well. Designing Internet of Things applications require such consideration for fully automated communication between "the thing" and an application in "the cloud" by help of AIDC. Questions for looking at security are e.g. is the THING the authentic one, is it a counterfeit item, are the data correct? For RFID certain security features are available already like password protection or Crypto Suites (ISO/IEC 29167-XX) but there is nothing like this for AIDC media in general which includes Barcode and 2d-symbols. There was no ISO standard available yet but the South African Standard "SANS 1368 Digital Signature" for securing authenticity for e.g. car license plates (Fig. 16) , certificates, etc. This standard has been passed to SC 31. SC 31 recognized that the solution would satisfy increasing demand for security features and accepted the "Digital Signature" to become ISO/IEC 20248 Automatic identification and data capture techniques -- Data structures -- Digital Signature meta structure.

Fig. 16) DigSig verification of a QR+RFID tagged car licence plate by smart phone

After taken as an SC 31 project input was received by SC 31/WG 2 members to make DigSig fit for AIDC applications. In Sapporo the experts Bertus Pretorius (Australia), Steyn Geldenhuis (South Africa), Rainer Schrundner (Germany), Dick Fischer (USA), Ehara Masaki (Japan) (see Fig. 15) and the editor of this report sit together polishing technical integration issues for DigSig in AIDC media (see notes Fig. 17). The results have been inserted in the current draft for moving the revision in the stage to become Committee Draft (CD).

Under https://en.wikipedia.org/wiki/ISO/IEC_20248 it is already to read:

"ISO/IEC_20248 Digital Signature Meta Structure specifies a method whereby data stored within a bar code and/or RFID tag is structured and digitally signed. The purpose of the standard is to provide an open and interoperable method, between services and data carriers, to verify data originality and data integrity in an offline use case. The ISO/IEC 20248 data structure, in short "DigSig", refers to a small, in bit count, digital signature. ISO/IEC 20248 will provide an effective and interoperable method to exchange data messages in the Internet of Things [IoT] and machine to machine [M2M] services allowing intelligent agents in such services to authenticate data messages and detect data tampering".

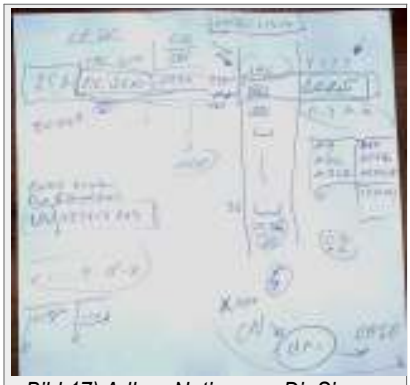


Bild 17) Adhoc-Notizen zu DigSig vor dem Editieren

Quick IoT solution - Product-to-Internet communication

Internet connection with Smart Phone by QR-Code is common practice. The fast growth of the application shows how easy it is to get access to information stored somewhere in the net just by scanning a code. But an Internet link in a QR does not allow unique identification nor tracking & tracing nor secured functionality. The [1]Joint AIDC Experts Group of Industries and Healthcare took the initiative to develop a "light IoT" system not by replacing a unique item code by a URL (as done in regular QR) but by combining item data with a portal URL. That URL will allow "pointing to a process" for immediate internet response dedicated to a specific item. (Fig. 18) The response can enable automatic access to Material Safety Data Sheets (MSDS) to maintenance instructions and it could even link to a dialog for a specific process like maintenance. On request the ASC DI Maintenance Committee (DIMC) registered two ISO/IEC 15418 ASC DIs for this purpose, the URL DI "33L" just for adding a URL to an unique item code and as second the **Pointer to Process (P2P) DI** "34L". DI "34L" includes a process after scanning for generating a "Target URL" out of the item data and the connected P2P URL. The after scan generated URL will point to the intended process e. g. linking straight to information e. g. dedicated to a specific serial number of a product. This precisely dedicated URL can open specific dialogs or open access to specific documents. Already the P2P solution has been adopted by DIN 66277 Electronic Name Plate completing the 2d + RFID hybrid solution with a link to Internet sources for object relevant information, maintenance docs., etc. IEC TC 91 adopted it with IEC 62090, Edition 2.0. for access to product related documents (see chapter below).

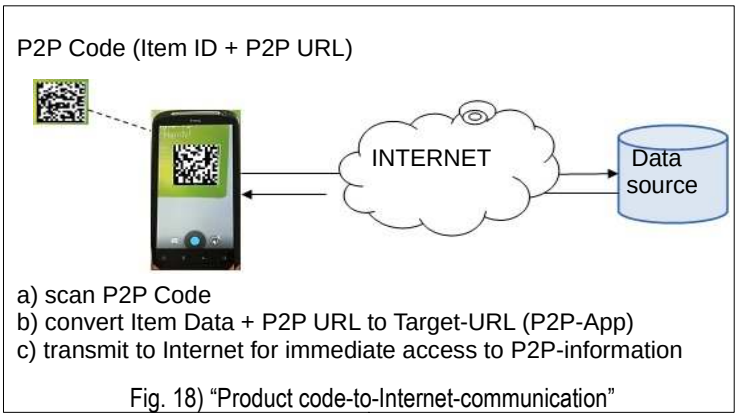


Fig. 18) "Product code-to-Internet-communication"

For more comprehensive information to *DIN SPEC 16589 see:*
http://www.din.de/de/mitwirken/normenausschuesse/nia/projekte/wdc-proj:din21:246254368

AIDC application standards of other working groups

taking the technology base from SC 31

ISO 62090 Product Package Label update by IEC TC 91 & EDIFICE

The standard "IEC 62090 PRODUCT PACKAGE LABELS FOR ELECTRONIC COMPONENTS USING BAR CODE AND TWO-DIMENSIONAL SYMBOLOGIES", rev. 2002 is currently getting an update to synchronize it with the updates of the AIDC standards of SC 31 and to include state of the art functionality, like "Product to Internet" communication by help of the Pointer to Process ASC DI "34L" and the use of 2d-symbols. The working draft for IEC 62090 – 2016 was prepared by the ADC committee of EDIFICE, the association of the electronic industries (chair Erich Günter, editor Rainer Schrundner) and communicated to the IEC TC 91 Electronics Assembly Technology, secretariat JAPANESE INDUSTRIAL STANDARDS COMMITTEE (JISC). The update is scheduled for finalization end of 2017 as IEC 62090, Edition 2.0.

CEN TC 225 European Norm (EN) for "Electronic ID Plate"

The by DIN prepared standard "DIN 66277 Identification plate with RFID tag and/or 2D bar code: 2014" was submitted to CEN TC 225, WG 4 AIDC Applications in order to lift the national standard to European Norm (Editor Rainer Schrundner). In conjunction with this lift, input was received to enable different technologies using Barcode, RFID HF and UHF and/or NFC as carriers. The features of the Electronic ID-Plate will include hybrid technologies like 2d-symbols and RFID (Fig. 19) or NFC, but also new developments on the data level like ID-Plate to Internet communication and use of ISO/IEC 20248 Digital Signature for securing the data. The project is scheduled for publication in 2017.

Fig. 19) Electronic ID Plate applied to a motor

[1]Joint AIDC Experts Group of AIM DACH, EDC, EDIFICE, EHIBCC

Fig. 20) ISO/IEC JTC 1/SC 31: Cooperation of highest level for standardization of AIDC
Group photo Sapporo 2016

Outlook

Not every year there is an anniversary, such as the 20 years of the SC 31, but every year the AIDC standards evolve in the course of technology and market development. Barcode- & RFID applications increase and merge in strategic development projects like „Internet of Things“, M2M and Industrie 4.0 becoming a module for and of it. AIDC developes as an essential module, that cars for unique identification and connection between object and electronic system. Neue Akzente für automatisierte Lösungen sind mit der „Produkt-zu-Internet-Kommunikation „P2P“ und den dazugehörigen Sicherheitsmechanismen in Form von „DigSig“ gesetzt, aber auch mit Updates zu bestehenden Codes, wie DMRE zu DataMatrix. Der Ausblick richtet sich auf die vielfältigen Anwendungspotentiale für diese Standards, die meist langfristig wirken. Die Marktentwicklungen werden dazu Schübe aus zwei Richtungen erhalten, einmal technologisch aber auch durch gesetzliche Anforderungen Barcode und RFID zwingend einzusetzen, nämlch zur Sicherung der Rückverfolgbarkeit, die das weltweite UDI-System zum Ziel hat. Das schauen wir uns gemeinsam 2017 genauer an. Sehen wir uns dazu im Juni 2017 zur Plenarsitzung des SC 31 wieder.

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Liaisons of industries and healthcare:
AIM DACH – AIM Germany, Austria, Switzerland, www.AIM-d.de
DIN NA 043-01-31 – Normalization Institute Germany, www.din.de
EDIFICE – Electronic Industries, Europe, USA, Asia, www.edifice.org
EHIBCC – European Health Industry Business Communication Council, www.ehibcc.com
IFA – IFA-Informationsstelle für Arzneimittel, http://www.ifaffm.de/de/ifa-coding-system
JTCH AIDC – Joined Technical Committee Healthcare, www.hibc.de, www.vddi.de

Logos of cooperation partners and contributors for the standardization activities:

Annex 1) Quick guide: Global unambiguity for items A,B,C – D structure

ISO/IEC 15459 sets the commonly agreed hierarchy for generating unambiguous codes under the lead of WG 2 Data Structures (chart see Fig. 20). The hierarchy originally was taken by ISO from CEN EN 1572 and extended from transport units to all levels of items. The rules are rather simple; ISO accredits a Registration Authority (A) to interested institutions B) who assigning unique Company Identification Codes (C) to users/companies on request. Companies having got a CIN are in the position to mark any item globally unambiguously like products, packages, transport units, containers, but also for papers, equipment, locations and even persons identified by unique wrist bands or ID Cards.

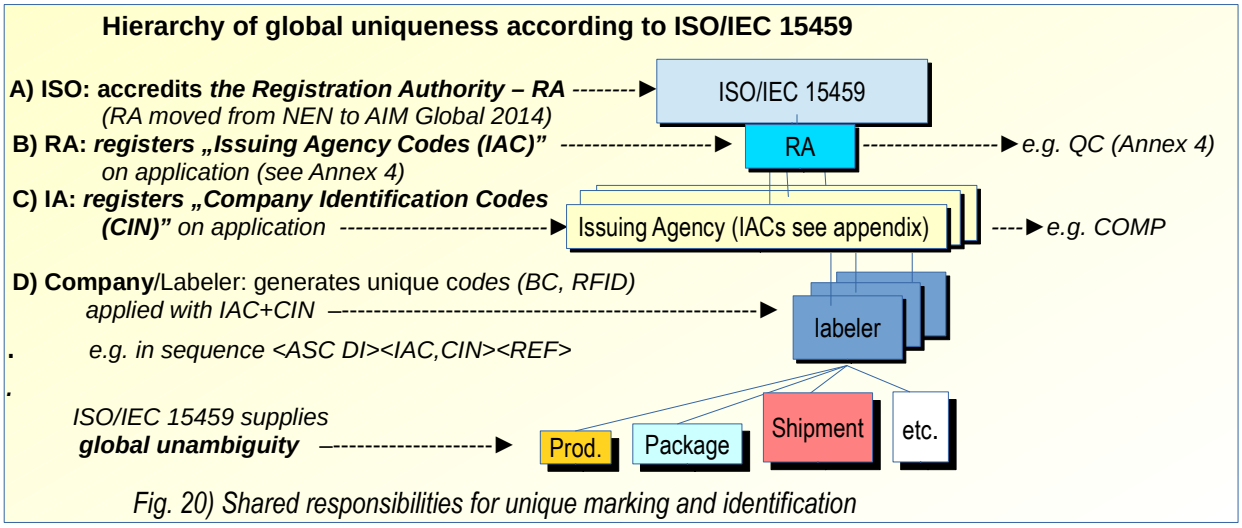


Fig. 20) Shared responsibilities for unique marking and identification

How to get to globally unambiguous product codes

The prerequisite for labeling an item unambiguously is the availability of a registered CIN from one of the Issuing Agencies. As next the characteristic of the item number to be encoded uniquely determines the syntax to be used. E. g. the ISO/IEC 15418 ASC DIs are for alphanumeric product reference used on average for 10 characters or up to 20 where the ISO/IEC 15418 GS1 Application Identifiers define a product reference as a Global Trade Item Number (GTIN) with typical 3, 4, or 5 digits max. and country related. The Health Care Bar Code system sets a max. of 18 alpha numeric characters.

Quick guide for labelers how to get a globally unique product code
e.g. for the product REF **M4215R73**:

I) Check the format of your product number (e.g. for **M4215R73**) for choosing one of the ISO/IEC 15418 formats as syntax for the code
→ a) if numeric 5 digit max – go for ISO/IEC 15418 ASC Data Identifiers or GS1 Application Identifiers or HIBC (depending of the customer areas)
→ b) if more than 5 digits or alphanumeric – go for ASC Data Identifiers including HIBC, IFA-PPN
II) Decide for the most convenient format, e.g. ASC Data Identifiers for REF **M4215R73**:
III) Decide for an Issuing Agency supporting to encode **M4215R73** by ASC DI, than
→ a) apply for a CIN, e. g. "COMP" from E.D.C. (IAC "QC")
→ b) chose the appropriate DI "25P" for the unique sequence <DI><IAC><CIN><REF>
→ c) build a sample sequence for your product reference **M4215R73**:
<25P><QC><COMP><**M4215R73**> for encodation as: 25PQCCOMP**M4215R73**
→ d) in case of a serialized product add SN 1234567 headed by DI "S": <S><1234567>
for encodation as: 25PQCCOMP**M4215R73**+S**1234567**
→ e) if required add other data elements like LOT (DI "1T", Expiry Date "D", etc) and use Syntax ISO/IEC 15434 (not illustrated with Fig. 20) for 2D symbols or RFID
IV) chose a symbology depending on data volume, available size and customer area, e.g. Code 128 (if enough place) or Data Matrix or go for RFID (Fig 20).

That's it --►

Fig. 21) Uniquely serialized product code in Data Matrix and RFID

Annex 2) List of available Issuing Agencies as source for CINs with their IACs

REGISTER of ISSUING AGENCY CODES for ISO/IEC 15459, version 2016-07-12, order A to Z

	Register ordered by Issuing Agency Name	IAC
1	ABOL SOFTWARE INC. 413 Creekstone Ridge, Woodstock GA 30188, USA	LN
2	Bosch und Siemens Hausgeräte GmbH, Carls-Wery-Strasse 34, D-81739 MUENCHEN, DE	VBS
3	Ghana Revenue Authority, PMB, TUC Post Office, Accra, GHANA	GH
4	DALO, Danish Defence Acquisition & Logistics Organization, Box 220, Arsenalvej 55, 9800 Hjorring, DK	KDK
5	DHL Express Benelux Terminalweg 36 3821 AJ AMERSFOORT, NL	VGL
6	DHL Freight GmbH, c/o Deutsche Post AG, Finance Operations, SSC Accounting, 44113 Dortmund, DE	ND
7	DOD-DLIS, Department of Defense - Defence Logistics Information Service, 74 Washington Avenue N 7 BATTLE CREEK, MI 49037-3054 USA	LD
8	Dun & Bradstreet 103 JFK Parkway Short Hills, NJ 07078, USA	UN
9	Federal State Unitary Enterprise “NIISU”, Sokolnichesky Val str. 37/10, 107113 Moscow, RUSSIA	VDS
10	GS1 AISBL, Avenue Louise 326, bte 10, BE 1050 Brussels, BELGIUM	0-9
11	ECRI Institute, 5200 Butler Pike Plymouth Meeting PA 19462-1298, USA	VEC
12	EDIFICE, Electronic Data Interchange for Companies with Interest in Computing and Electronics, de Meeûssquare 38-40, 1000 Brussels, Belgium, BELGIUM	LE
13	EHIBCC, Jozef Israelsplein 8, 2596 AS DEN HAAG, NL	LH
14	Eurodata Council, Koesener Str. 85, 06618 Naumburg, DE	QC
15	FIATA, International Federation of Freight Forwarders Ass. Schaffhauserstr. 104, 8152 Glattbrugg, CH	LF
16	FSBI <<46 CRI RFMD>>Federal State Budgetary Institution <<46 Central Research Institute of the Russian Federation Ministry of Defence>>	KRIJ
17	Försvarets Materielverk (Swedish Defence Materiel Administration), Myndighetsuppgifter / MS 520, Försvarsstandardisering, 11588 Stockholm, SE	KSE
18	GTF, Group of Terrestrial Freight Forwarders, 50, rue de Châteaudun, 75009 PARIS, FRANCE	VGT
19	Health Industry Business Communications Council 2525 East Arizona Biltmore, Phoenix, AZ 85016 USA	RH
20	IBM Deutschland Management & Business Support GmbH Wilhelm-Fay-Str. 32, D-65936 Frankfurt, DE	VIB
21	ICCBBA, International Council for Commonality in Blood Bank Automation Inc. P.O. Box 11309, San Bernandino, CA, 92423-1309, USA	LI
22	IEEE, 445 Hoes Lane, Piscataway, NJ 08854 USA	VIE
23	IFA, Informationsstelle für Arzneimittel GmbH, Hamburger Allee 26-28, 60486 Frankfurt am Main, DE	PP
24	JIPDEC, Japan Information processing Development Corporation / Electronic Commerce Promotion Center, Roppongi First Building 9-9 Roppongi 1-chome, Minato-ku TOKYO, 106-0032, JAPAN	LA
25	KIDL, Korea Institute of Distribution and Logistics, 17F KCCI Bldg. 45 Namdaemunno 4-Ga Jung-Gu SEOUL 100-743, KOREA	KKR
26	Ministerie van Defensie, Commando Diensten Centra IVENT Dienstverlening Postbus 90004, 3509 AA UTRECHT, NL	KNL
27	National Tax Agency Japan, 3-1-1 Kasumigaseki Chiyoda-ku, Tokyo 100-8978	TAJ
28	NSPA (Nato Support Agency), 11, Rue de La Gare L-8302 CAPELLEN G.D., LUXEMBOURG	D
29	Odette International Limited, 71 Great Peter Street LONDON SW1P 2BN, UK	OD
30	Post NL, Prinses Beatrixlaan 23 2595 AK 's-GRAVENHAGE, NL	NL
31	Namsa, 11, Rue de la Gare, 8302 Capellen, G.D., LUXEMBOURG	VNA
32	SIEMENS AG, Industry Automation Division I IA IT D SR, Gleiwitzer Str. 555, 90475 Nürnberg, DE	SI
33	Siemens Enterprise Communications GmbH & Co. KG, Hofmannstr. 51, 81379 MUENCHEN, DE	VEG
34	TCJ5/4-I, United States Transportation Command, 508 Scott Drive, Scott AFB IL 62225-5357, USA	KUS
35	Teikoku Databank, Ltd. (TDB), 2-5-20 Minami Aoyama, Minatoku, Tokyo	VTD
36	Telcordia Technologies, Inc. 1 Telcordia Drive RRC-6C137 PISCATAWAY, NJ 08854-4151, USA	LB
37	Telefonaktiebolaget LM Ericsson Torshamnsgatan 23 Kista SE-16483 STOCKHOLM, SWEDEN	LM
38	Universal Postal Union, Case Postale, 3000 BERNE 15, SWITZERLAND	J
39	Xifrat Daten AG Poststrasse 6 6300 ZUG, SWITZERLAND	RG

Source of the table:
AIM Global, version 2016-07-12 applied with counter by the editor. Link *http://www.aimglobal.org/?Reg_Authority15459*
PDF document: *http://www.aimglobal.org/resource/resmgr/registration_authority/Register-IAC-Def_2016.pdf*

Annex 3) Issuing Agencies support different data formats for codes

ISO/IEC 15459-2 accredited Issuing Agencies do supply not only a unique Company Identification Code (CIN) but with it they determine the AIDC data structure as well which has effect to data elements specifically for product and transport unit codes. In consequence the choice of an Issuing Agency it is also a choice for the structure of key codes.
Table 2) shows a selection of typical Issuing Agencies of industry and healthcare areas supporting the data structures for either alpha numeric or numeric only product codes and transport codes.

Table 2 Issuing Agencies, their AC's and supported data structures and data capacity

Excerpt of the list of Issuing Agencies for Company ID's (CIN) ▼	***IAC*** ▼	***Length of a CIN*** ▼	***typical CIN, e.g.*** ▼	***[2]Support for structure & code capacity***		
				Data structure ▼	***Product code 2-20an ▼ (max. 50)***	***Transport code 2-20an ▼ (max. 35)***
Eurodata Council	QC	4an	CPRO	ASC	YES	YES
DUN Dun & Bradstreet	UN	9n	123456789	ASC	YES	YES
GS1 and EPC Global	0-9	3-7	1212345	GS1 (EPC)	3-5n	9n
EDIFICE European Electronic Industries Association	LE	3an	IBM	ASC	YES	YES
EHIBCC European Health Industries Assoc.	LH	4an	ELMI	ASC, HIBC	18	YES
ODETTE European Automotive Industry	OD	4an	A2B3	ASC	YES	YES
TELECORDIA ANSI ATIS-0300220 Telecom. Equipment	LB	4an	CSCO	ASC	YES	YES
UPU Universal Postal Union, etc.	J	6an	D00001	ASC	YES	YES

Table 2 illustrates that the majority of Issuing Agencies is supporting a data structure for alpha numeric codes for products and transport units whereas only one Agency restricts users to numeric reference codes. Support of data structures might be one decisive selection criteria for choosing a specific Agency.

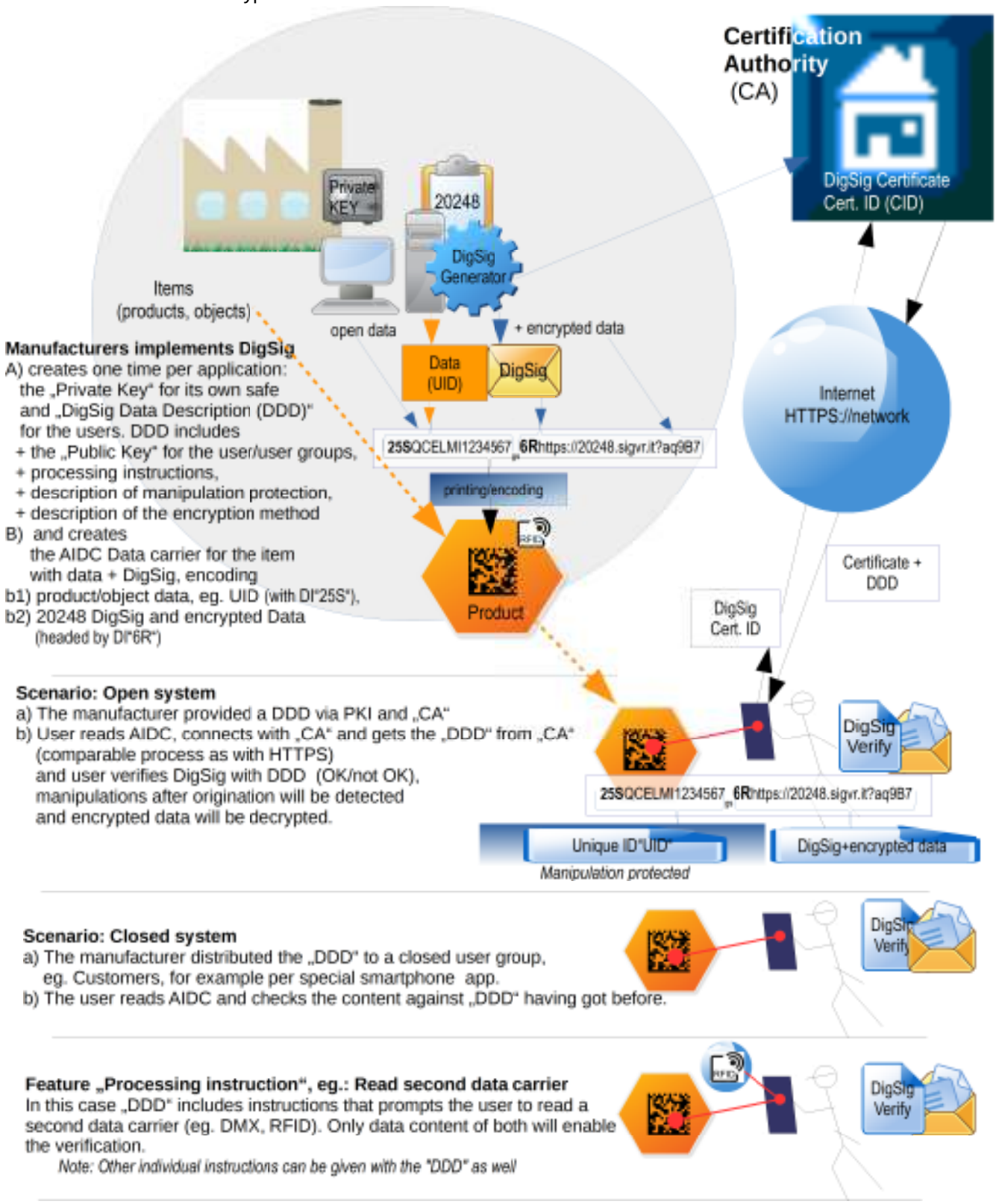
Note 1: The complete list of registered Issuing Agencies and its codes see Annex 4

Note 2: Some regulations may accredit specific Issuing Agencies only as a choice for generating unique codes, e. g. the FDA US accredited the Issuing Agencies GS1, HIBC and ICCBBA for the Unique Device Identifier (UDI) system. In this case the code structures of that agencies apply for the application.

[2] to “YES” for 2-20 characters: This is the general recommendation but the maximum length is 50 for product codes and 35 for Transport ID codes. Exceptions are the shorter codes of the GS1 structure.

Annex 4) Illustration ISO/IEC 20248 Digital Signature applications scenarios

ISO/IEC 20248 Digital Signature (DigSig) for authenticity of unique item codes (UIDs) and for encryption of data information



Legend:
CA Certification Authority Public Key Infrastructure (PKI)
CID DigSig Certificate ID: Part of DDD as reference to the Digital Certificate available throgh PKI or in an App
DA Domaine Authority: For example the manufacturer creating the DigSig
DDD DigSig Data Description: Contains the description for the verification process
UID: Unique Identifier: Unique ID according to ISO/IEC 15459-4 for identifying items in logistical processes

Note: Link to more information to ISO/IEC 20248 in Wikipedia: https://en.wikipedia.org/wiki/ISO/IEC_20248

Annex 5) Selection of AIDC Standards

ISO/IEC 19762 Harmonized Vocabulary (5 languages)

Documents of ISO/IEC JTC 1/SC 31/WG 1 Data Carrier (ORM)

ISO/IEC 15417 Code 128
ISO/IEC 15438 PDF 417
ISO/IEC 16022 Data Matrix
ISO/IEC 18004 QR Code
ISO/IEC 15415 Bar code symbol print quality test specification-Two-dimensional symbols
ISO/IEC 15416 Bar code symbol print quality test specification-Linear symbols
ISO/IEC 16480Reading and display of ORM by mobile devices
ISO/IEC 30116 OCR Quality Testing
ISO/IEC 21471 Extended Rectangular Data Matrix DMRE

Documents of ISO/IEC JTC 1/SC 31/WG 2 Data Structure“

ISO/IEC 15418 GS1 Application Identifiers and ASC Data Identifiers
ISO/IEC 15434 Syntax for High-Capacity ADC Media
ISO/IEC 15459 Unique Identification, Part 1 to 6
ISO/IEC 29162 Guidelines for using ADC Media (Bar code & RFID)
ISO/IEC 29161 Unique Identification for IoT
ISO/IEC CD 20248 Digital Signature meta structure

Documents of ISO/IEC JTC 1/SC 31/WG 4 RFID for Item Management

ISO/IEC 18000-1 REV 1 (including Battery Assistants, Sensor functions)
ISO/IEC 18000-2 AMD 1 (including Battery Assistants, Sensor functions)
ISO/IEC 18000-6, part 61 to 64, rev. 2 (incl. Battery Assistants, Sensor functions)
ISO/IEC 18000-7 REV 1 (including Battery Assistants, Sensor functions)
ISO/IEC 15963 Tag ID: applied with the list of IC manufacturer ID‘s
ISO/IEC 29160 RFID Emblem
ISO/IEC 24791-Part 1 to 6 Software System Infrastructure (SSI)
ISO/IEC 24753: RFID & Sensors with reference to IEEE 1451.7
ISO/IEC 15961, 15962: RFID Data protocol – Update
ISO/IEC 15961-4: Sensor commands (NP)
ISO/IEC 29172-19179 Mobile item identification and management
ISO/IEC 29143 Air Interface Specification for Mobile Interrogators

Documents of ISO/IEC JTC 1/SC 31WG 4 Security on Item Management

ISO/IEC 29167 Air Interface for file management and security services for RFID
ISO/IEC 29167 part 10-19 crypto suites with ISO/IEC 19823-X Conformance test methods

Documents of the Liaison ISO TC122/WG 10 for BC&RFID applications

ISO 22742 Linear bar code and two-dimensional symbols for product packaging
ISO 28219 Labeling and direct product marking with linear bar code and 2d- symbols
ISO 15394 Bar code and 2d- symbols for shipping, transport and receiving labels
ISO 17363 Supply chain applications of RFID – Freight containers
ISO 17364 Supply chain applications of RFID – Returnable transport items
ISO 17365 Supply chain applications of RFID – Transport units
ISO 17366 Supply chain applications of RFID – Product packaging
ISO 17367 Supply chain applications of RFID – Product tagging

DIN standards

DIN 66401 Unique Identification Mark – UIM
DIN 66403 System Identifiers
DIN 66277 Identification plate with RFID tag and/or 2D bar code
DIN 16587 DMRE - Data Matrix Rectangular Extension
DIN Spec 16589 Product to Internet communication - Pointer to Process

Other application related standards

IEC 62090 Product Package Labels for Electronic Components using Bar Code & 2-d symbologies
Global Transport Label V3, www.odette.org
Global Guideline for Returnable Transport Item Identification, www.aiag.org
GS1 Global Specifications, www.gs1.com
HIBC Health Industry Bar Code, www.hibc.de
PaperEDI Standard, www.eurodatacouncil.org
Set Label Standard, www.edifice.org (June 2011)

Note 1: ISO, CEN and DIN standards are available directly or via national bodies, e.g. www.din.de
Note 2: For more information please contact the author or DIN NA 043-01-31