ISO JTC 1 IEC INFORMATION TECHNOLOGY STANDARDS **SC 31** **Automatic identification and data capture techniques**

Overview of SC 31 standards related to bar codes and encoded data

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ISO/IEC JTC 1/SC 31 - Automatic identification and data capture techniques

SC 31 is a sub-committee of the Joint Technical Committee 1, established between the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). JTC 1 is responsible for Information Technology standards.

The scope of SC 31 is the standardisation of data structures and technologies for Automatic Identification and Data Capture (AIDC). The AIDC technologies addressed by SC 31 include:

- Optical Character Recognition (OCR)
- Bar codes
- Radio Frequency Identification (RFID)
- Real Time Location Systems (RTLS).

SC 31 comprises four Working Groups dealing with:

- Bar codes (WG 1)
- Identification and Data structure (WG 2)
- Radio communications (WG 4)
- Applications (WG 8).

Purpose & scope of this paper

The scope of this document is to provide a short overview of the standards managed by SC 31 in the areas of bar codes and encoded data, which might help identifying the correct SC 31 standard to use for resolving a business need involving AIDC

The basic concept of bar code scanning and related standards is presented in this document, aiming to assist readers who may not be familiar with the subject.

Not in scope are:

- Standards managed by SC 31 related to RFID.
- Standards managed by other Standard Development Organisation's (SDO's) namely for encoded data.

Bar code Reading Process

This figure illustrates the basic process of reading a bar code with a bar code scanner.

1) A bar code scanner shines light on the bar code.
2) Light reflects into a light-detecting component of the scanner. Clear areas of the bar code reflect most light, dark areas reflect least. The reflection differences are translated into electric pulses, which are then translated into characters.
3) The strings of characters captured by the bar code scanner are sent to a computer for processing.

Bar codes can also be read by cameras, for instance integrated into mobile devices like smartphones or tablets, in which case the translation of the lines, bars or dots into data is performed by a piece of software integrated into the reading device. The data can then be processed on the reading device or by an external computer connected to it.

This figure illustrates process of reading a bar code with a camera equipped mobile device.

Bar code basic principles

Here are some basic principles to keep in mind when referring to bar code applications:

1) A bar code is a representation of data with signs, such as lines, dots, squares, hexagons or rectangles.
2) Bar codes are static, which means that once printed on a support such as a piece of paper, they cannot be changed.
3) Bar codes can be displayed on the screen of a mobile device or a monitor.
4) The major benefit of using bar codes is fast and accurate data capture. Using bar codes enables to avoid manual data input that can be slow and prone to errors.

Standards requirements

Many standards have been developed in SC 31 over the years to meet Users' demand and to follow the evolution of technologies. The different categories of standards related to data and bar codes are described below.

1) Data Content

When considering a bar code project, the first question to be answered relates to the data that will be represented in bar code format and captured automatically. A good practice is to consider international standards right from the start. Even if the immediate need is for some internal applications with limited impact, the adoption of international standards right from the beginning will enormously facilitate the growth of the application in scope and number of parties impacted.

The data content standards can be categorised as follows:

- **Identifiers**

A bar code is typically associated with a physical object and it carries the object identifier.
The ISO/IEC 15459 series of standards provide a way to uniquely identify different types of objects, thereby opening access to global supply chains. ISO/IEC 15459 also specified the method to uniquely associate a company with the identification message.

- **Qualifiers**

A bar code can encode different data elements. For example, the identifier of a product, the manufacturing lot number of the item and its production date. Standard qualifiers are used to explicitly indicate the type of data that is encoded.
ISO/IEC 15418 specifies two alternative ways to qualify data elements encoded in a bar code.

- **Syntax**

Linear or one-dimensional (1D) bar codes represent data using a series of parallel bars and spaces of varying widths. They can encode up to 50 or 70 characters, depending on symbol type. Two-dimensional (2D) bar codes store data in both the horizontal and vertical dimensions through a pattern of dots, squares, hexagons or rectangles. 2D bar codes can in theory encode up to 7,000 characters.
For some applications, many data elements are required in the bar code. Users may want data encoding formats to be compatible with electronic data interchange standards that they already use for sending and receiving electronic documents.
ISO/IEC 15434 specifies standard ways to encode complex sets of data in different syntaxes, such as UN/EDIFACT, ANSI X.12, JSON and others.

- **Digital signature**

For some bar code applications, it is critical to ensure that the data was not tampered with, that the source of the data can be authenticated and that the data stored on the data carrier can be considered as the original issued copy of the data.
ISO/IEC 20248 specifies the structure of digital signatures that can be encoded in AIDC data carriers.

2) Data Carrier

- **Bar code symbologies**

Many different types of bar codes have been created since the invention of the bar code concept in the nineteen fifties. SC 31 has developed standard specifications for five 1D bar codes, ten 2D bar codes and one composite bar code (mixing 1D and 2D), which have since become some of the most popular bar code symbologies in use.

The choice of the bar code to use can be dictated by the market. If left at the discretion of the bar code issuer, the decision on which symbology to use depends on criteria such as the following:

- Required capacity, i.e. number or characters to be encoded
- Data type: numeric only, alpha-numeric, Latin only or non-Latin characters.
- Printing process and substrate quality

- **Quality**

It only makes sense to create bar codes if there is a reasonable assurance that they can be read and processed. The objective measurement of the quality of the bar codes and of the equipment used to

read, print and verify bar codes is thus important. SC 31 has issued more than ten standards dealing with quality, conformance and performance testing.

- **Symbology type**

Upon successful completion of the reading process, the bar code scanner transmits the data strings to the computer to which it is connected. It can also inform the computer about the type of bar code from which the data was read.
ISO/IEC 15424 specifies a preamble message generated by the reader and interpretable by the receiving system, which indicates the bar code symbology or other origin of transmitted data, together with details of certain specified optional processing features associated with the data message.

SC 31 standards related to data content and bar codes

Categories: DC = Data Content; QU = Quality ; SY = Symbology; TD = Transmitted data

Standard #	Short title	Cat	WG
ISO/IEC 15418	GS1 Application Identifiers and ASC MH10 Data Identifiers and maintenance	DC	WG 2
ISO/IEC 15434	Syntax for high-capacity ADC media	DC	WG 2
ISO/IEC 15459-1	Unique identification — Part 1: Individual transport units	DC	WG 2
ISO/IEC 15459-2	Unique identification — Part 2: Registration procedures	DC	WG 2
ISO/IEC 15459-3	Unique identification — Part 3: Common rules	DC	WG 2
ISO/IEC 15459-4	Unique identification — Part 4: Individual products and product packages	DC	WG 2
ISO/IEC 15459-5	Unique identification — Part 5: Individual returnable transport items (RTIs)	DC	WG 2
ISO/IEC 15459-6	Unique identification — Part 6: Groupings	DC	WG 2
ISO/IEC 20248	Digital signature data structure schema	DC	WG 2
ISO/IEC 15415	Bar code symbol print quality test specification — Two-dimensional symbols	QU	WG 1
ISO/IEC 15416	Bar code print quality test specification — Linear symbols	QU	WG 1
ISO/IEC 15419	Bar code digital imaging and printing performance testing	QU	WG 1
ISO/IEC 15421	Bar code master test specifications	QU	WG 1
ISO/IEC 15423	Bar code scanner and decoder performance testing	QU	WG 1
ISO/IEC 15426-1	Bar code verifier conformance specification — Part 1: Linear symbols	QU	WG 1
ISO/IEC 15426-2	Bar code verifier conformance specification — Part 2: Two-dimensional symbols	QU	WG 1
ISO/IEC 24458	Bar code printer and bar code reader performance testing specification	QU	WG 1
ISO/IEC 29158	Direct Part Mark (DPM) Quality Guideline	QU	WG 1
ISO/IEC TR 24244	Bar code print quality test specification — Evolution of the grading and measurement of linear symbols in ISO/IEC 15416	QU	WG 1
ISO/IEC TR 24720	Guidelines for direct part marking (DPM)	QU	WG 1
ISO/IEC 15417	Code 128 bar code symbology specification	SY	WG 1
ISO/IEC 15420	EAN/UPC bar code symbology specification	SY	WG 1
ISO/IEC 15438	PDF417 bar code symbology specification	SY	WG 1

ISO/IEC 16022	Data Matrix bar code symbology specification	SY	WG 1
ISO/IEC 16023	International symbology specification — MaxiCode	SY	WG 1
ISO/IEC 16388	Code 39 bar code symbology specification	SY	WG 1
ISO/IEC 16390	Interleaved 2 of 5 bar code symbology specification	SY	WG 1
ISO/IEC 18004	QR Code bar code symbology specification	SY	WG 1
ISO/IEC 20830	Han Xin Code bar code symbology specification	SY	WG 1
ISO/IEC 21471	Extended rectangular data matrix (DMRE) bar code symbology specification	SY	WG 1
ISO/IEC 23634	JAB Code polychrome bar code symbology specification	SY	WG 1
ISO/IEC 23941	Rectangular Micro QR Code (rMQR) bar code symbology specification	SY	WG 1
ISO/IEC 24723	GS1 Composite bar code symbology specification	SY	WG 1
ISO/IEC 24724	GS1 DataBar bar code symbology specification	SY	WG 1
ISO/IEC 24728	MicroPDF417 bar code symbology specification	SY	WG 1
ISO/IEC 24778	Aztec Code bar code symbology specification	SY	WG 1
ISO/IEC 15424	Data Carrier Identifiers (including Symbology Identifiers)	TD	WG 1

References

- General information about SC 31 - https://www.iso.org/committee/45332.html
- History of SC 31: https://jtc1info.org/sd-2-history/jtc1-subcommittees/sc-31/
- Public material: https://www.iso.org/committee/45332.html?view=documents

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