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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Data container format for wearable sensor

Conteneur de données pour capteur prêt-à-porter

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DATA CONTAINER FORMAT FOR WEARABLE SENSOR

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The text of this International Standard is based on the following documents:

Draft	Report on voting
100/4141/CDV	100/4178/RVC

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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INTRODUCTION

The target audience for this document includes the following stakeholders who have an interest in the systems and services using wearable devices:

- Consumer electronics (CE) and Information Communications Technology (ICT) device manufacturers.
- System integrators who want to utilize wearable device and technologies.
- Service operators who are interested in the IoT and multimedia systems and services.
- Stakeholders who want to understand the technologies and requirements for wireless connectivity between wearable sensor nodes and hub coordinator.

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DATA CONTAINER FORMAT FOR WEARABLE SENSOR

1 Scope

This International Standard specifies a Container format for sensing data and its system requirements. This document applies to edge computing devices such as smartphones, home gateways, multimedia coordinators, etc., and cloud systems.

This document describes the following technical specifications:

- Container format for wearable sensor data,
- Schema Repository that defines the parameters and syntax of sensor data,
- Communication and system requirements between the edge computing device and Schema Repository.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

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- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1
Container
data structure that encapsulates one or multiple numbers of digital data

Note 1 to entry: Each piece of digital data consists of various kinds of data such as sensor signals, audio signals, video signals, metadata, programs, etc.

3.2
Schema Information
structural information that represents the data structure of a Container payload

3.3
Schema Repository
server that stores Schema Information

4 Abbreviated terms

BAN Body area network
CRC Cyclic redundancy check
DoS Denial of Service
FEC Forward error correction
GTIN Global trade item number
IANA Internet assigned numbers authority
ID Identifier
IoT Internet of Things
MAC Medium access control
RS Reed Solomon
UUID Universal unique identifier

5 System structure

5.1 System overview

Sensing data detected by wearable sensors (e.g. vital sensors, environmental sensors, etc.) is transmitted from wearable sensors to edge computing devices (e.g. wearable signal aggregators, smartphones, etc.) through BAN (e.g. SmartBAN [1][1],[2]), Bluetooth®[2] [3] and other short range communications. Figure 1 shows a diagram in which (1) SmartBAN hub and (2) Bluetooth® client are installed in one (3) edge computing device for convenience. In reality, either (1) SmartBAN or (2) Bluetooth® client may be installed. The sensing data collected by either wireless method is encapsulated into a Container as a function of the (3) edge computing device. Then, the Container is transferred to an (4) IoT platform located in a cloud. When formatting the data collected by (1) SmartBAN hub or (2) Bluetooth® client into a Container in (3) edge computing device, the edge computing device can obtain the header configuration and payload information on how to encapsulate the sensing data into the Container from (5) Schema Repository if the edge computing device does not have any pre-set header configuration nor payload information for the above-mentioned wearable sensors.

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[1] Unless otherwise specified in the text of this document, the numbers in square brackets refer to the Bibliography.

[2] Bluetooth is the trademark of a product supplied by Bluetooth SIG, Inc. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

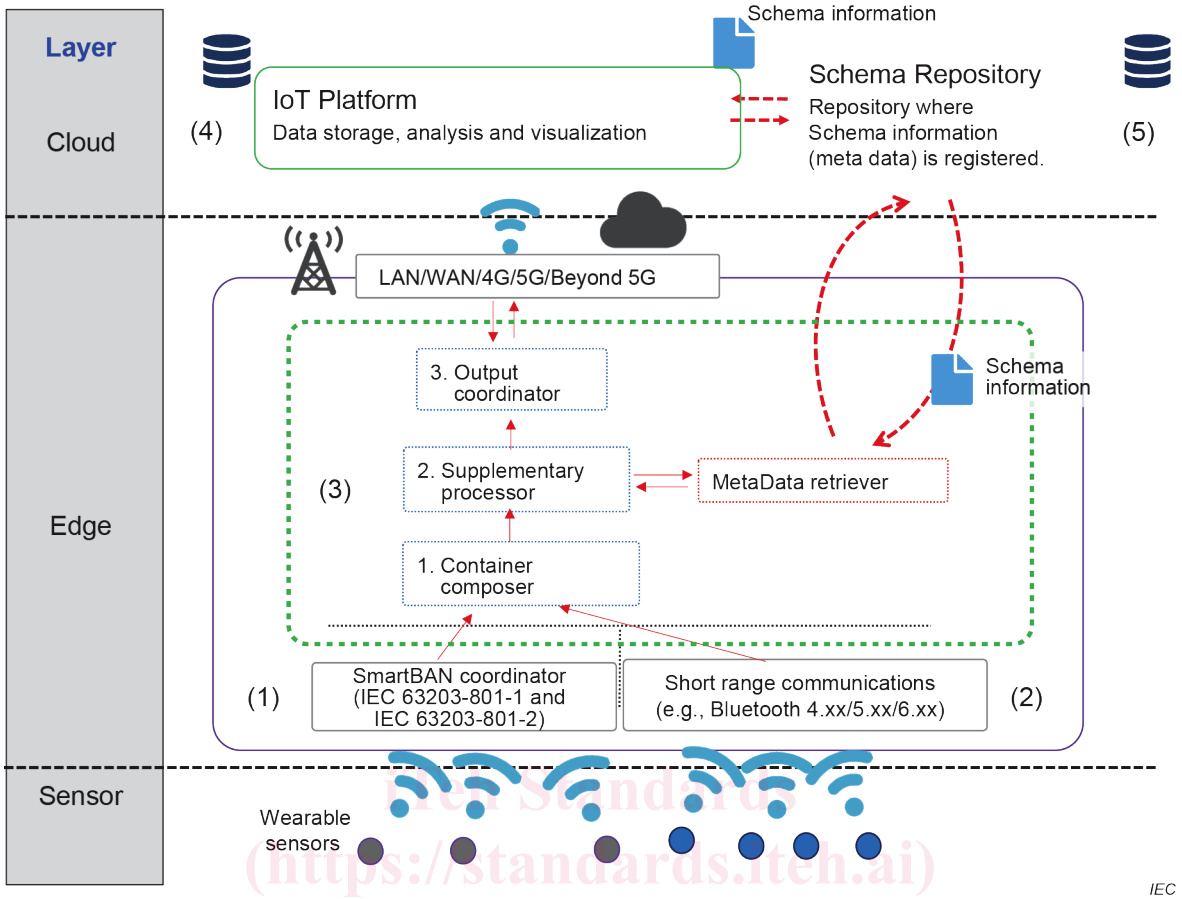

Figure 1 – System overview

5.2 Composition of Container format in edge computing device

5.2.1 General description

Figure 2 illustrates the composition of the Container format in an edge computing device.

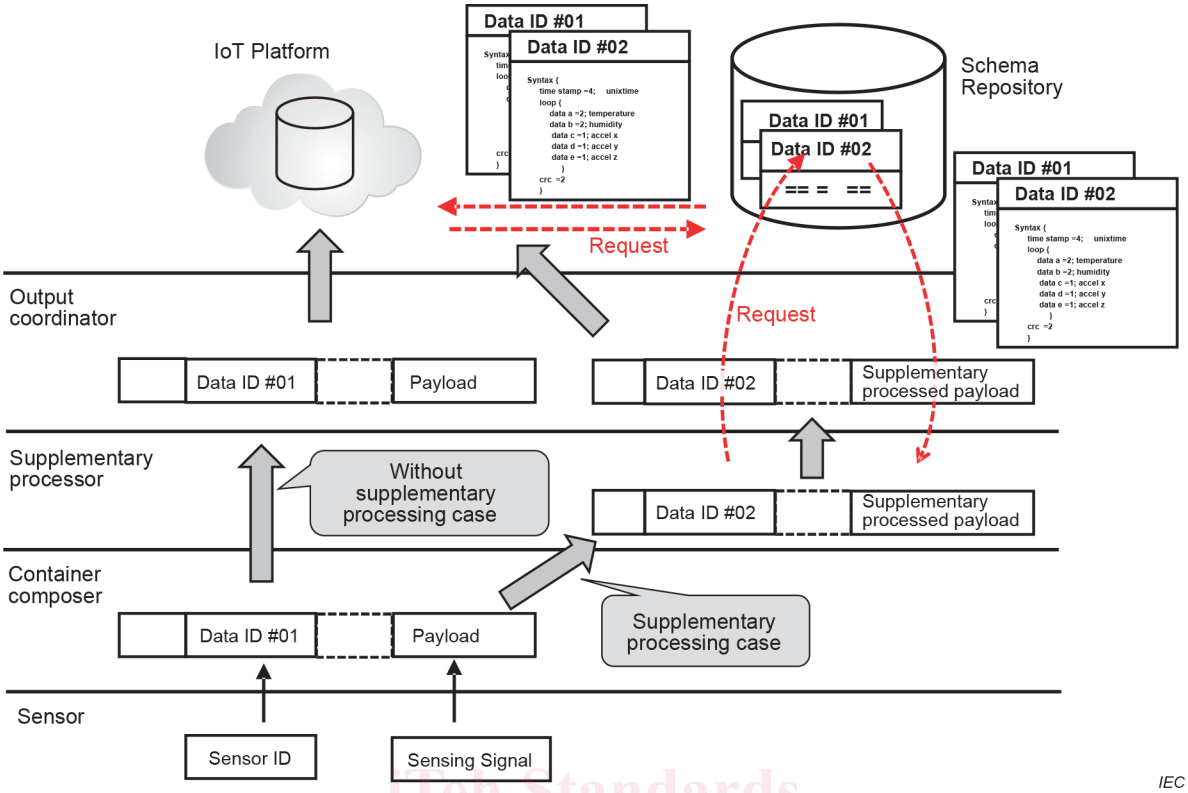

Figure 2 – Composition of Container format

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5.2.2 Container composer

The Container composer encapsulates the sensor data received from the sensor device into a Container as a payload and outputs it. When the Container composer receives the sensor data, the Container composer adds the attribute information to the received sensor data to form a Container.

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5.2.3 Supplementary processor

The Supplementary processor performs calculations and processing on the Container output from the Container composer. For example, the Supplementary processor can take a Container as an input and can output the result of performing an operation on the header and payload included in the Container as a new Container. Another example is that the Supplementary processor may calculate an average value or a maximum value of sensor data to respond to query operations. Further, the Supplementary processor may apply a window function or a filter based on the time or the number of data to the sensor data, and periodically aggregate the sensor data.

The Schema Repository stores and provides information necessary for interpreting Container data. The Schema Repository stores several units of Schema Information containing an attribute type for the header parameter and data type and sequence order described in the payload. The Schema Information is stored in a local file or in a location on the network that can be referenced by the Supplementary processor.

Upon receiving the input of the Container, the Supplementary processor divides the input Container data into a header area and a payload area. Subsequently, the Supplementary processor retrieves the Schema Information from the Schema Repository and applies the example given in this Subclause 5.2.3 on the supplementary processing on the Attribute Value stored in the header area and the value stored in the payload area.

5.2.4 Output coordinator

The Output coordinator receives the Container generated by Container composer or the Container to which the operation by Supplementary processor is applied. The Output coordinator stores the received Container and encapsulates it into a communication format suitable for the output destination (e.g. TCP), and then outputs it to the subsequent computational resources.

6 Container format

6.1 General description

The Container shall be formed by concatenation of a Container Header and a Container Payload as shown in Figure 3. The Container shall consist of a L_{hd} Byte header and L_{pl} Byte payload. The Length of payload shall be longer than or equal to zero Byte. In this Clause 6, big endian is applied for describing data.

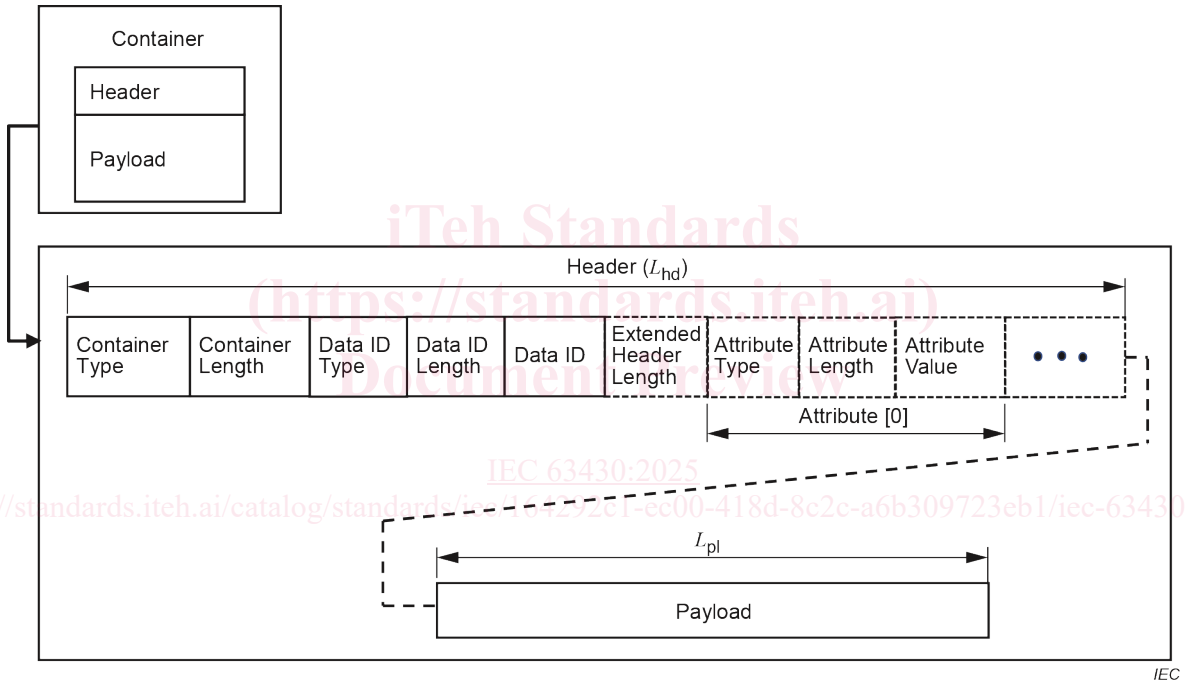

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Figure 3 – Container structure

6.2 Header format

6.2.1 Structure of Header format

Figure 4 illustrates the Header format for a Container. The common part of Container Header shall consist of:

- a Container Type field,
- a Container Length field,
- a Data ID Type field,
- a Data ID Length field and
- a Data ID field.

The extended part of Container Header shall consist of:

- an Extended Header Length field and
- one or many numbers of Attribute Type fields, Attribute Length fields and Attribute Value fields.

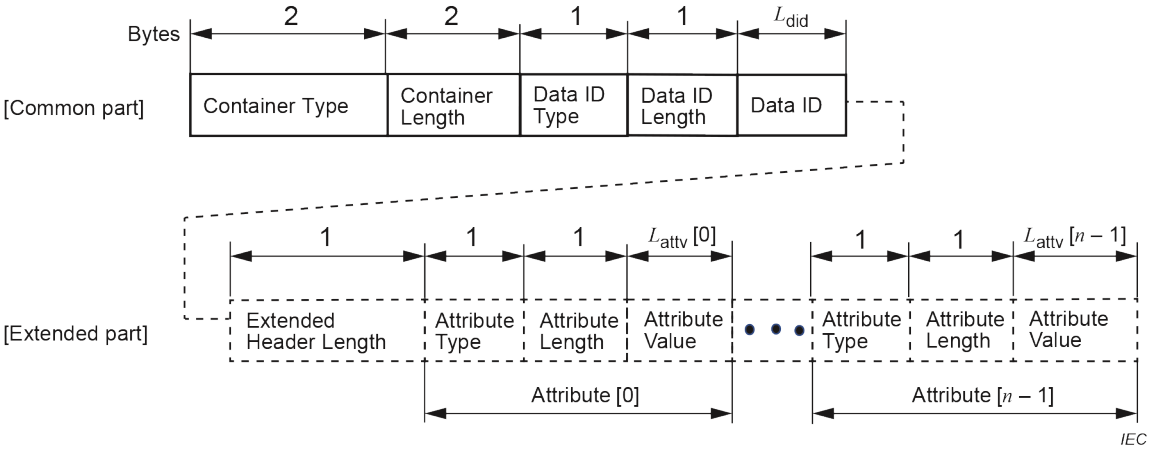

Figure 4 – Header format for bit stream type of Container

6.2.2 Container Type

The 2 Byte Container Type field shall set one of the values in Table 1.

The Container Type field shall be set at one of the following: '0101010101010101', '0011001100110011', '0110011001100110' or '0000111100001111' when the Container is composed for streaming process. The Container Type field shall be set at one of the following: '1010101010101010', '1100110011001100', '1001100110011001' or '1111000011110000' when the Container is composed for non-streaming process, including storage.

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Table 1 – Container Type

Streaming/Non-streaming	Extended Attributes (Yes/None)	Unfragmented payload / End of fragmented payload	First / Middle of fragmented payload
Streaming process	None	0101010101010101	0011001100110011
	Yes	0110011001100110	0000111100001111
Non-streaming process	None	1010101010101010	1100110011001100
	Yes	1001100110011001	1111000011110000

6.2.3 Container Length

The 2 Byte Container Length field shall indicate the Length of the entire Container from the beginning of Container Type to the end of payload in bytes.