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Short-range wireless sensor to device communication

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Foreword

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This document was prepared by Technical Committee ISO/TC 104, *Freight containers*, Subcommittee SC 4, *Identification and communication*.

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 use of wireless communication has expanded globally thanks to new wireless standards and very low-cost transceiver chips and modules. However, there is a need to specify the use of open protocols and intended behaviour in diverse use cases, to allow compatibility of hardware from different origins. Wireless communication capability has become an easy and relatively low-cost addition to almost any Internet of things (IoT) device in transport and logistics, where a wireless feature can enhance performance, convenience, and/or marketability. In the machine-to-machine communication space, remote keyless entry (RKE) and remote pairing are the most widespread. A wireless temperature sensor within a cargo container, for instance, can transmit temperature updates to the IoT device, which serves as a gateway to the Internet thus providing a "near real-time" temperature monitoring for sensitive cargo. When choosing a communication technology between the measuring sensor and the IoT device in one environment, e.g. a freight container, the operational context is playing a crucial role, i.e. container design, distance from sensor to IoT device, location of both on/in a container and communication protocols that support these hardware items.

NOTE So-called "real-time" is mainly used as a commercial term. Due to the limitation of the technology to transmit data non-stop, in order to manage the battery lifetime expectation, connectivity with the cloud computing is done in defined periodical interval, e.g. every 5 min, 15 min, 1 h or similar. Therefore, from a technical point of view, this reference is related to "near real-time".

ISO/TS 18625 provides guidance for a system and its enabling devices, used to track, monitor and/or report the status of the container. Based on existing technology, ISO/TS 18625 defines three levels (Tier 0, Tier 1 and Tier 2) of capabilities for container tracking device (CTD) to be matched with the needs of the users (e.g. a shipper, a consolidator, a logistic service provider and more).

This document refers to CTD as described in Tier 2 of ISO/TS 18625 (reporting without a reader using technologies such as satellite or cell phone) and CTD's "local" communication within one environment to dependent wireless sensors. Being in one environment, the expected wireless communication between sensors and a CTD can be short-range, however it needs to withstand conditions prescribed by the purpose of such technical application. Therefore, a choice of the applicable technologies is directly related to the types of sensors and measurements they make, container configuration, location of the receiving device, size of the message and minimal sending interval.

Short-range wireless technology refers to the technology that can communicate wirelessly within a smaller diameter region. Short-range wireless communication technology has a considerable application prospect in the field of container equipment and management. Short-range wireless communication technologies are NFC, wireless network protocols based on IEE 802.11 family of standards, IEEE 802.15.4 based specifications, Bluetooth®[1)], for example.

This document describes existing wireless technology on sensor to telematic device communication and defines a list of those communication types which can be perceived as "open protocols"- non-proprietary license free technology. Non-proprietary technology implemented on both "ends", sensor and devices/gateway, enables diversity in manufacturing origin of wirelessly communicating active hardware items within one container environment. Therefore, this document specifically focuses on wireless and short-range communication. The goal of this document is to enable interoperability among different IoT/telematic hardware manufacturers and encourage the diversification of the applicable to the CTU environment digital solutions. The anticipated effects and benefits are as follows:

— diversification of connected products available for short-range communication within one container environment;

— interoperability between hardware items of different origin used and applied to one freight container;

1) Bluetooth is the trademark of a product supplied by the Bluetooth Special Interest Group. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO/IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

— improved safety of freight container and quality of the transported goods through digital supervision and monitoring of the transportation conditions;

— improved transparency of freight container transportation condition among the modalities of the supply chain.