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Edition 1.0 2014-03

INTERNATIONAL STANDARD

Information technology – Wireless beacon-enabled energy efficient mesh network (WiBEEM) standard for wireless home network services – Part 2: MAC layer



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IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

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INFORMATION TECHNOLOGY – WIRELESS BEACON-ENABLED ENERGY EFFICIENT MESH NETWORK (WIBEEM) STANDARD FOR WIRELESS HOME NETWORK SERVICES –

Part 2: MAC layer

FOREWORD

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International Standard ISO/IEC 29145-2 was prepared by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology.

The list of all currently available parts of the ISO/IEC 29145 series, under the general title *Information technology – Wireless beacon-enabled energy efficient mesh network (WiBEEM) for wireless home network services*, can be found on the IEC web site.

This International Standard has been approved by vote of the member bodies, and the voting results may be obtained from the address given on the second title page.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

INTRODUCTION

This International Standard specifies the WiBEEM (Wireless Beacon-enabled Energy Efficient Mesh network) protocol, which provides low-power-consuming mesh network functions by enabling the “beacon mode operation”. WiBEEM is based on IEEE 802.15.4 standard with additional upper layer protocols and a specific usage of the MAC layer protocol. Through the novel use of beacons, WiBEEM technology achieves longer battery life, larger network support, quicker response, enhanced mobility and dynamic reconfiguration of the network topology compared with other protocols such as ZigBee.

In the beacon mode, Beacon information propagates over the entire mesh network nodes during the BOP (Beacon-Only Period) of the superframe structure without any beacon conflicts by utilising a smart beacon scheduling technique in the BOP. It also provides location information about moving devices without spending extra time running a positioning and locating algorithm by using RSSI (Received Signal Strength Indication). These features allow the WiBEEM protocol to be widely used for wireless home network services in the ubiquitous network era.

One of the key features of the WiBEEM protocol is that it has a special time interval called BOP (Beacon-Only Period) in the superframe structure that allows more than two beacons to be transmitted. This unique time period is located at the beginning of the Superframe. Because the BOP does not use the CSMA/CA mechanism, the network will not work properly in the beacon mode unless an appropriate algorithm is applied. This algorithm needs to manage and control multiple beacons in a single superframe. The solution is the Beacon Scheduling method applied in the BOP to avoid collisions among beacons, providing synchronisation among all the nodes of the entire mesh network.

For the network layer, the NAA (Next Address Available) mechanism, which is a short address allocation algorithm, has been adopted to provide an efficient way of utilising the complete 16-bit address space. The NAA algorithm does not limit the maximum number of children nodes that a node of a mesh network can have. Since the number of children nodes is unlimited, the NAA mechanism allows the WiBEEM protocol to be used not only for home network services, but also for community services. WiBEEM can be used where high network expandability through efficient use of short address spaces, device mobility and end-to-end QoS are required.

This part of the standard ISO/IEC 29145 specifies the Medium Access Control (MAC) layer of the WiBEEM protocol.

INFORMATION TECHNOLOGY – WIRELESS BEACON-ENABLED ENERGY EFFICIENT MESH NETWORK (WIBEEM) STANDARD FOR WIRELESS HOME NETWORK SERVICES –

Part 2: MAC layer

1 Scope

This part of ISO/IEC 29145 specifies the MAC of the WiBEEM (Wireless Beacon-enabled Energy Efficient Mesh network) protocol for wireless home network services that supports a low power-consuming wireless mesh network as well as device mobility and QoS.

2 Normative reference

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 29145-1:2014, *Information technology – Wireless beacon-enabled energy efficient mesh network (WiBEEM) for wireless home network services – Part 1: PHY layer*

IEEE 802.15.4:2003, *IEEE Standard for Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 15.4: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Low-Rate Wireless Personal Area Networks (LR-WPANs)*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 29145-1, as well as the following apply.

3.1.1
association
service used to establish the membership of a device in a wireless mesh network

3.1.2
co-ordinator
wireless device configured to provide synchronisation services through the transmission of beacons

Note 1 to entry: If a co-ordinator is the principal controller of a wireless mesh network, it is called the WMC (WiBEEM Mesh Co-ordinator).

3.1.3
device
entity containing an implementation of the WiBEEM applications, NWK, MAC and physical interface to the wireless medium

3.1.4
disassociation
service that removes an existing association

3.1.5
frame
data format of aggregated bits from a medium access control (MAC) layer entity transmitted in a specified sequence

3.1.6
logical channel
abstract representation of a communications link independent of the physical implementation

Note 1 to entry: Defines "logical channel" as it is used this International Standard.

3.1.7
mobile device
device that uses network communications while in motion

3.1.8
orphaned device
device that has lost its parent node with its associated mesh network

3.1.9
packet
format of aggregated bits transmitted in a specified sequence across the physical medium

3.1.10
payload data
contents of a data message that is being transmitted

3.1.11
personal operating space
space of typically about 10 m around a person or an object, no matter whether this person or object is stationary or in motion

3.1.12
protocol data unit
unit of data exchanged between two peer entities

3.1.13
service data unit
information delivered as a unit through a service access point (SAP)

3.2 Abbreviations

The following acronyms and abbreviations are used in this standard. They are commonly used in other industry publications.

BI	Beacon Interval
BN	Beacon Number
BO	Beacon Order
BOP	Beacon Only Period
BSN	Beacon Sequence Number
BTTSL	Beacon Transmit Time Slot Length
CAP	Contention Access Period