

This is a preview - click here to buy the full publication



ISO/IEC 29145-3

Edition 1.0 2014-03

INTERNATIONAL STANDARD

Information technology – Wireless beacon-enabled energy efficient mesh network (WiBEEM) for wireless home network services – Part 3: NWK layer

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE

P

ICS 35.200

ISBN 978-2-8322-1450-3

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	5
1 Scope.....	6
2 Normative references	6
3 Terms, definitions and abbreviations	6
3.1 Terms and definitions.....	6
3.2 Abbreviations.....	7
3.3 Conventions.....	8
4 Conformance.....	8
5 Overview of the WiBEEEM technology.....	8
6 NWK layer specifications.....	8
6.1 General.....	8
6.2 NWK layer service specifications	8
6.2.1 Overview	8
6.2.2 NWK data service.....	9
6.2.3 NWK management service.....	12
6.2.4 Network formation	14
6.2.5 Allowing devices to join	16
6.2.6 Begin as a router.....	18
6.2.7 Joining a network.....	19
6.2.8 Joining a device directly to a network	22
6.2.9 Leaving a network	24
6.2.10 Resetting a device.....	26
6.2.11 Receiver synchronisation.....	27
6.2.12 Information base maintenance	30
Bibliography.....	34
Figure 1 – NWK layer structure.....	9
Figure 2 – Message sequence chart for resetting the network layer	27
Figure 3 – Message sequence chart for synchronising in a non-beaconing network	30
Table 1 – NLDE-DATA.request parameters.....	10
Table 2 – NLDE-DATA.confirm parameters	11
Table 3 – NLDE-DATA.indication parameters.....	12
Table 4 – Summary of primitives used by NWK layer	12
Table 5 – NLME-NETWORK-DISCOVERY.request parameters	13
Table 6 – NLME-WiBEEEM-DISCOVERY.confirm paramters	14
Table 7 – Network descriptor information fields.....	14
Table 8 – NLME-WRC-OPERATING.request parameters	15
Table 9 – NLME-NETWORK-FORMATION.confirm parameters	16
Table 10 – NLME-ALLOW-JOINING.request	17
Table 11 – NLME-ALLOW-JOINING.confirm parameters.....	17

Table 12 – NLME-SET-SUPERFRAME.request parameters	18
Table 13 – NLME-SET-SUPERFRAME.confirm parameters	19
Table 14 – NLME-JOIN.request parameters	20
Table 15 – NLME-JOIN.indication parameters.....	21
Table 16 – NLME-JOIN.confirm parameters	22
Table 17 – NLME-DETERMINED-JOIN.request parameters	22
Table 18 – Capability information parameter format	23
Table 19 – NLME-DETERMINED-JOIN.confirm parameters	23
Table 20 – NLME-LEAVE.request parameters.....	24
Table 21 – NLME-LEAVE.indication parameters	25
Table 22 – NLME-LEAVE.confirm parameters	25
Table 23 – NLME-RESET.confirm parameters	27
Table 24 – NLME-SYNC.request parameters	28
Table 25 – NLME-SYNC.confirm parameters	29
Table 26 – NLME-READ-NIB.request parameters	30
Table 27 – NLME-READ-NIB.confirm parameters	31
Table 28 – NLME-WRITE-NIB.request parameters.....	32
Table 29 – NLME-WRITE-NIB.confirm parameters	33

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

Part 3: NWK layer

FOREWORD

- 1) ISO (International Organization for Standardization) and IEC (International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards. Their preparation is entrusted to technical committees; any ISO and IEC member body interested in the subject dealt with may participate in this preparatory work. International governmental and non-governmental organizations liaising with ISO and IEC also participate in this preparation.
- 2) In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.
- 3) The formal decisions or agreements of IEC and ISO on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC and ISO member bodies.
- 4) IEC, ISO and ISO/IEC publications have the form of recommendations for international use and are accepted by IEC and ISO member bodies in that sense. While all reasonable efforts are made to ensure that the technical content of IEC, ISO and ISO/IEC publications is accurate, IEC or ISO cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 5) In order to promote international uniformity, IEC and ISO member bodies undertake to apply IEC, ISO and ISO/IEC publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any ISO/IEC publication and the corresponding national or regional publication should be clearly indicated in the latter.
- 6) ISO and IEC provide no marking procedure to indicate their approval and cannot be rendered responsible for any equipment declared to be in conformity with an ISO/IEC publication.
- 7) All users should ensure that they have the latest edition of this publication.
- 8) No liability shall attach to IEC or ISO or its directors, employees, servants or agents including individual experts and members of their technical committees and IEC or ISO member bodies for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication of, use of, or reliance upon, this ISO/IEC publication or any other IEC, ISO or ISO/IEC publications.
- 9) Attention is drawn to the normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 10) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 29145-3 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 the 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 ISO/IEC 29145 specifies the network layer (NWK) of the WiBEEM protocol for wireless home network services that support a low-power-consuming wireless mesh network as well as device mobility and QoS.

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

Part 3: NWK layer

1 Scope

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

2 Normative references

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*