**IEEE P802.15**

**Wireless Personal Area Networks**

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| Project | IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) | |
| Title | Annex draft contribution for TG4k MAC | |
| Date Submitted | [16 May 2012] | |
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| Re: | [TG4k LECIM PHY development, MAC support] | |
| Abstract | Draft contribution on Annex D and P related to the LECIM MAC features | |
| Purpose | Draft standard development | |
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**Annex D**

(informative)

**Protocol implementation conformance statement (PICS) proforma**

D.1 Introduction

D.7 PICS proforma tables

D.7.1 Functional device types

D.7.2 Major capabilities for the PHY

D.7.3 Major capabilities for the MAC sublayer

D.7.3.1 MAC sublayer functions

**Table D.5—MAC sublayer functions**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Item number** | **Item description** | **Reference** | **Status** | **Support** | | |
| **N/A** | **Yes** | **No** |
| MLFx | Relayed Slot-Link Network | Clause 5.1.2.7, 5.1.6.7 | O |  |  |  |
| MLFx.x | RSLN-enabled PAN | Clause 5.1.2.7 | O |  |  |  |
| MLFx.x | Synchronous relaying | Clause 5.1.6.7 | O |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

D.7.3.2 MAC frames

**Table D.6—MAC frames**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Item number** | **Item description** | **Reference** | **Transmitter** | | **Receiver** | |
| **Status** | **Support N/A Yes No** | **Status** | **Support N/A Yes No** |
| MF4.x | RSLN-Association request | 5.3.15.1 | O |  | O |  |
| MF4.x | RSLN-Association response | 5.3.15.2 | O |  | O |  |
| MF4.x | RSLN-Management request | 5.3.15.3 | O |  | O |  |
| MF4.x | RSLN-Management response | 5.3.15.4 | O |  | O |  |
|  |  |  |  |  |  |  |

**Annex P**

(informative)

**Low Energy, Critical Infrastructure Monitoring Systems**

P.1 Introduction

P.1.1 LECIM characteristics

a) Minimal infrastructure

— Star topology

The following MAC enhancements are included to support the LECIM PHYs defined in Clause 19:

— Synchronous MAC frame relaying to extend the coverage of a star network

P.1.2 Use case examples

P.1.3 LECIM behaviors

P.1.3.2 Low energy

LECIM applications require significantly low energy operation to be able to last 20 years either on original battery supply or energy harvesting mechanisms. In order to achieve low energy operation, LECIM networks should minimize device “on” durations: scheduled receiver-on to avoid the wait for receiving, contention free access to minimize retransmissions, and reduction of any overhead octets not absolutely necessary to transmit.

P.1.3.3 Coverage extension

To keep infrastructure costs to a minimum, LECIM networks should maximize the coverage and maintain it over 20 years long with the minimal changes of networks. LECIM devices require large link margins to achieve long ranges. To extend the coverage for supporting sparse dispersed devices or to maintain connections in dramatically changing environments, the frame relaying repeaters between the concentrator and devices are required to sustain the connections without reconfiguring the whole LECIM networks.

P.2 Functionality added: DSSS, FSK, fragmentation, frame priority, RSLN, PIBs, IEs

***Insert the following clause after P.2.4:***

P.2.5 RSLN

The basic topology of the LECIM network is a direct connection between the concentrator and a device. The RSLN-enabled PAN provides contention free slot-link between the concentrator and each device by maintaining the cyclic-superframe slot-link structure in the network synchronously and by assigning a primary bidirectional device slot, supplementary bidirectional device slots, and prioritized device slots in a cyclic-superframe to a device.

To extend the coverage of a star network without reconfiguring the whole network, the RSLN-enabled PAN equips a synchronous frame relaying repeater between the concentrator and a device. According to the pre-defined slot relaying rules, a frame from a device is relayed inward and a frame from the concentrator is relayed outward synchronously in an RSLN repeater. There is no need of additional networking overheads for routing and forwarding a frame.

By extending the coverage of a star network, the RSLN-enabled PAN supports that the LECIM network can serve sparse dispersed devices. In case of changing environments, by locating a synchronous frame relaying repeater, the RSLN-enabled PAN provides a detour between the concentrator and a device without reconfiguring the LECIM networks.