**IEEE P802.15**

**Wireless Personal Area Networks**

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| Project | IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) |
| Title | **Proposed Resolutions for sensing primitives** |
| Date Submitted | May 2024 |
| Sources | Rojan Chitrakar, Lei Huang (Huawei)rojan.chitrakar@huawei.com |  |
| Re: |   |
| Abstract |  |
| Purpose | To propose resolution for sensing primitives related comments for “P802.15.4ab™/D (pre-ballot) C Draft Standard for Low-Rate Wireless Networks” .  |
| Notice | This document does not represent the agreed views of the IEEE 802.15 Working Group or IEEE 802.15.4ab Task Group. It represents only the views of the participants listed in the “Sources” field above.It is offered as a basis for discussion and is not binding on the contributing individuals. The material in this document is subject to change in form and content after further study. The contributors reserve the right to add, amend or withdraw material contained herein. |

Rev 0: Initial version.

***Comment Indices in 15-24-0010-00-04ab-consolidated-comments-draft-c:***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Name** | **Index#** | **Pg** | **Sub-Clause** | **Ln** | **Comment** | **Proposed Change** | **Disposition** |
| Billy Verso | 220 | 111 | 10.39.7 | 25 | The standard is missing API primitives to configure sensing frame format, and to send and report sensing frames. I recommend we use the MCPS-DATA primitives for TX and RX of SENS frames. And something like the MLME-STS primitive for configuration. | Add/Modify appropriate primitive for configuration of SENS packet format, and MCPS primitives to include any additional parameters to support sensing packet to transmission and reception. | Revised |
| Billy Verso | 221 | 111 | 10.39.7 | 26 | The text is missing procedures with respect to upper layer interactions. If we take 15-23-0208 as a good model for this, then lets generate text to cover the necessary interactions and provide (or update existing) primitives to give the necessary controls and/or status reports. For example, I reckon that after reception of a sensing packet that higher layer (sensing application) should extract the CIR and generate the sensing report (formatting the IE) which it tells the MAC to send it in the appropriate slot when the intended recipient device is scheduled to listen for it.  | Add/Modify appropriate primitives to support sensing, e.g., extract CIR, etc., and define the procedures also. | Revised |

**Discussion**：



**Disposition: Revised**

**Disposition Detail:** The text is based on slide 3 of 15-23-0208 as suggested by comment #221.

**Proposed text changes on P802.15.4ab™/D (pre-ballot) C:**

**8.3.2 MCPS-DATA.request**

***Change the subfield as follows (Track changes ON)***

The MCPS-DATA.request primitive requests transmission to another device.

The semantics of this primitive are as follows:

MCPS-DATA.request (

SrcAddrMode,

DstAddrMode,

DstPanId,

DstAddr,

Msdu,

MsduHandle,

HeaderIeList,

PayloadIeList,

HeaderIeIdList,

NestedIeSubIdList,

AckTx,

GtsTx,

IndirectTx,

SecurityLevel,

KeyIdMode,

KeySource,

KeyIndex,

UwbPrf,

DataRequestRangingDescriptor,

UwbPreambleSymbolRepetitions,

DataRate,

PanIdSuppressed,

SeqNumSuppressed,

SendMultipurpose,

FrakPolicy,

CriticalEventMessage,

~~DataRequestSensingDescriptor~~

)

…

**Table 8-27—MCPS-DATA.request parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid Range** | **Description** |
| … |  |  |  |
| ~~DataRequestSensingDescriptor~~ | ~~Structure~~ | ~~As in Table 8-x1~~ | ~~Provides sensing related parameters.~~ |
| NOTE-Some values may be unsupported or invalid depending on the capabilities of the PHY or its current transmission mode as selected by other parameters. |

…

***~~Add the following at the end of the subclause (Track changes ON)~~***

~~The DataRequestSensingDescriptor structure groups the sensing related parameters for the MCPSDATA.request primitive. The elements of the DataRequestSensingDescriptor are defined in Table 8-2x1.~~

**~~Table 8-2x1—Elements of the DataSensingRangingDescriptor~~**

|  |  |  |  |
| --- | --- | --- | --- |
| **~~Name~~** | **~~Type~~** | **~~Valid Range~~** | **~~Description~~** |
| ~~SensingPhr~~ | ~~Boolean~~ | ~~TRUE, FALSE~~ | ~~TRUE if the Sensing field of PHR is set to be one, FALSE otherwise. This parameter is only valid when the PHR is present and has a Sensing field.~~ |
| ~~RequestCirTxList~~ | ~~List of Address~~ | ~~Each Address is a Short or Extended address~~ | ~~Provides a list of nodes for which CIR IEs are requested.~~ |
|  |  |  |  |

**8.3.3 MCPS-DATA.confirm**

***Change the subfield as follows (Track changes ON)***

The MCPS-DATA.confirm primitive reports the results invoking the MCPS-DATA.request primitive.

The semantics of the MCPS-DATA.confirm primitive are as follows:

MCPS-DATA.confirm (

MsduHandle,

Timestamp,

RangingReportDescriptor,

NumBackoffs,

HeaderIeList,

PayloadIeList,

AckPayload,

FramePending,

Rssi,

Status,

SensingReportDescriptor

)

The primitive parameters are defined in Table 8-29.

**Table 8-29—MCPS-DATA.confirm parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid Range** | **Description** |
| … |  |  |  |
| SensingReportDescriptor | Structure | As in Table 8-x2 | Reports sensing related results. |

**8.3.4 MCPS-DATA.indication**

The MCPS-DATA.indication primitive indicates the reception of data from another device or when ranging information is available upon reception of a packet from another device.

The semantics of this primitive are as follows:

MCPS-DATA.indication (

SrcAddrMode,

SrcPanId,

SrcAddr,

DstAddrMode,

DstPanId

DstAddr,

Msdu,

HeaderIeList,

PayloadIeList,

MpduLinkQuality,

Dsn,

FramePending,

Timestamp,

SecurityLevel,

KeyIdMode,

KeySource,

KeyIndex,

AckSent,

RangingReportDescriptor,

DataRate,

Rssi,

SensingReportDescriptor

)

The primitive parameters are defined in Table 8-30.

**Table 8-30—MCPS-DATA.indication parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid Range** | **Description** |
| … |  |  |  |
| SensingReportDescriptor | Structure | As in Table 8-x2 | Reports sensing related results. |

***Add the following at the end of the subclause (Track changes ON)***

The elements of the SensingReportDescriptor structure are defined in Table 8-2x2. This is a parameter used in both the MCPS-DATA.confirm primitive and the MCPS-DATA.indication primitive and is used to report sensing related results.

**Table 8-2x2—Elements of the SensingReportDescriptor**

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid Range** | **Description** |
| SensingReceived | Enumeration | NOT\_REQUESTED, SENSING\_ACTIVE, NOT\_SUPPORTED | This value indicates the result of receiving a PSDU as follows: A value of NOT\_REQUESTED indicates that no sensing is requested for the PSDU received. A value of SENSING\_ACTIVE indicates that sensing was requested for the received PSDU. A value of NOT\_SUPPORTED indicates that sensing is not supported but has been requested. |
|  |  |  |  |
|  |  |  |  |

**10.39 Sensing**

***Add the following at the end of the subclause***

**10.39.xx Primitives for sensing**

**10.39.xx.1 MLME-SENS.request**

The MLME-SENS.request primitive allows the next higher layer to request that the HRP-SDEV utilizes a given set of SENS parameters.

The semantics of this primitive are as follows:

MLME-SENS.request (

SensPacketStructure,

SensSegmentLength,

SensNumberSegments,

)

The primitive parameters are defined in Table 10-XX1.

**Table 10-XX1—MLME-SENS.request parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid Range** | **Description** |
| SensPacketStructure | Integer | 0 - 2 | This specifies the SENS packet structure to use. The values are defined in Table 20—Values of Sensing Packet Format subfield of the Common Sensing Control. |
| SensSegmentLength | Integer | 0 – x | This specifies the SENS segment length to use. The values are defined in Table 16-xxx. |
| SensNumberSegments | Integer | 0 - 3 | SensNumberSegments + 1 specifies the number of SENS segments.  |

**10.39.xx.2 MLME-SENS.confirm**

The MLME-SENS.confirm primitive reports the result of the attempt to configure the SENS parameters via the MLME- SENS.request primitive.

The semantics of this primitive are as follows:

MLME-SENS.confirm (

Status

)

The primitive parameter is defined in Table 10-XX2.

**Table 10-XX2—MLME-SENS.confirm parameter**

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid Range** | **Description** |
| Status | Enumeration | SUCCESS, INVALID\_PARAMETER | This parameter reports the result of the MLME-SENS.request attempt to configure SENS parameters. |

The MLME-SENS.confirm primitive is generated by the MLME and issued to its next higher layer in

response to an MLME-SENS.request primitive.

If any parameter in the MLME- SENS.request primitive is not supported or is out of range, the Status of INVALID\_PARAMETER is returned.

If the request to configure the SENS parameters was successful, the MLME issues the MLME- SENS.confirm primitive with a Status of SUCCESS.

**10.39.xx.3 MLME-SENSING.request**

The MLME-SENSING.request primitive is used by the next higher layer to request that the PHY respond with sensing related information. The MLME-SENSING.request primitive shall be supported by all SDEVs; however, the underlying sensing capability is optional in all cases.

The semantics of this primitive are as follows:

MLME-SENSING.request ()

If the feature is supported, the MLME will begin the procedure to gather the sensing related information.

**10.39.xx.4 MLME-SENSING.confirm**

The MLME-SENSING.confirm primitive reports the result of a request to the PHY to provide sensing related information. The MLME-SENSING.confirm primitive shall be supported by all SDEVs; however, the underlying sensing capability is optional in all cases.

The semantics of this primitive are as follows:

MLME-SENSING.confirm (

CIRreportIE,

Status

)

The primitive parameters are defined in Table 10-xx1.

**Table 10-XX2—MLME-SENSING.confirm parameter**

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid Range** | **Description** |
| CIRreportIE | Structure | As defined in 10.39.7.2 (CIR Report IE) | CIR taps obtained from a sensing measurement. |
| Status | Enumeration | SUCCESS, NO\_DATA | The status of the attempt to return sensing related information |

If the sensing related information is available, the Status parameter will be set to SUCCESS, and the CIRreportIE will contain valid data.

If the MLME-SENSING.request primitive is received when there is no sensing related information present, e.g., when the PHY is in the process of performing a measurement, the Status parameter will be set to NO\_DATA.