IEEE P802.15
Wireless Personal Area Networks

Project	IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)
Title	Sensing MSC and description
Date Submitted	3 December 2024
Source	Billy Verso (Qorvo), billy.verso at qorvo.com
Re:	IEEE P802.15.4ab
Abstract	Comment Resolutions for selected comments on the LB207 / P802.15.4ab D01.
Purpose	This document provides text changes intended to be part of the final IEEE Std 802.15.4ab (amendment to IEEE Std 802.15.4), as part of resolving selected comments from the consolidated spreadsheet (doc 15-24-0371) that have been assigned to the author to resolve.
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 "Source(s)" field above. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.
Release	The contributor acknowledges and accepts that this contribution becomes the property of IEEE and may be made publicly available by P802.15.
Patent Policy	The contributor is familiar with the IEEE-SA Patent Policy and Procedures. <https://standards.ieee.org/about/sasb/patcom/materials/>

CIDs addressed here:

1 Comment Index # 1241

Index	page	clause	line	Comment	Proposed Change
1241 (Billy)	129	10.39.4	23	We are missing a subclause about the control of sensing from the next higher layer perspective and how it all hangs together. I think the interactions should be based on the thoughts captured in 15-23-0208. It should employ a message sequence chart to illustrate the interactions.	I will prepare a submission to cover this, for consideration to be inserted in a suitable place in 10.39

Discussion/Introduction:

The commenter (me) said he would prepare a submission to provide the missing subclause, and this document (15-24-0557-01) is it. This is based on 15-23-0208.

The proposed resolution for this comment, is “Revised”, with the resolution being to insert the text & figure from the subsequent pages of this submission into the draft as a new subclause.

The proposed “suitable place” then is as a final subclause of 10.39.4

The figure and supporting text, on the subsequent pages of this submission, present a message sequence chart for two HRP-SDEV devices doing sensing, describing the interactions between the next higher layer and the MAC/PHYs of the HRP-SDEV devices.

NB: This resolution is dependent on 15-24-0552-02 being accepted to define the mechanism for the packet format configuration.

Note: The use of primitives in the standard is NOT defining a physical API that needs to be implemented, but rather a logical interface that serves to define the roles, the information that passes, and the separation of responsibilities between (a) what is considered to be part of the MAC+PHY specified by the standard and (b) what is considered to be the higher layer using the MAC and PHY. In products based on this standard this logical interface is generally invisible (buried internally) and does not need to exist in any concrete observable way.

The new subclause text and figure are on the following pages:

Changes with respect to P802.15.4ab D01:

10.39.4 Sensing Procedure

Insert the following as a new subclause within and at the end of the existing 10.39.4, (e.g. as 10.39.4.8):

10.39.4.8 Control of HRP UWB sensing

10.38.4.8.1 General

The next higher layer control of the sensing activity of the HRP-SDEV is achieved using primitives. The next higher layer issues primitives to configure the MAC and tell it what to send when, and when to turn on its receiver. The MAC issues primitives to give responses and inform the next higher layer of events.

10.38.4.8.2 Example interactions of a sensing exchange

Figure A presents a message sequence chart that illustrates both monostatic sensing and multistatic sensing cases. In the figure, device A is a sensing transmitter sending a sensing packet to device B which is a sensing receiver. Device B receives the packet from device A and subsequently sends a CIR report to device A, which illustrates a possible behavior of a device participating in multistatic sensing. Device A also receives the reflection of its transmitted packet from the environment which illustrates the behavior of the monostatic sensing case.

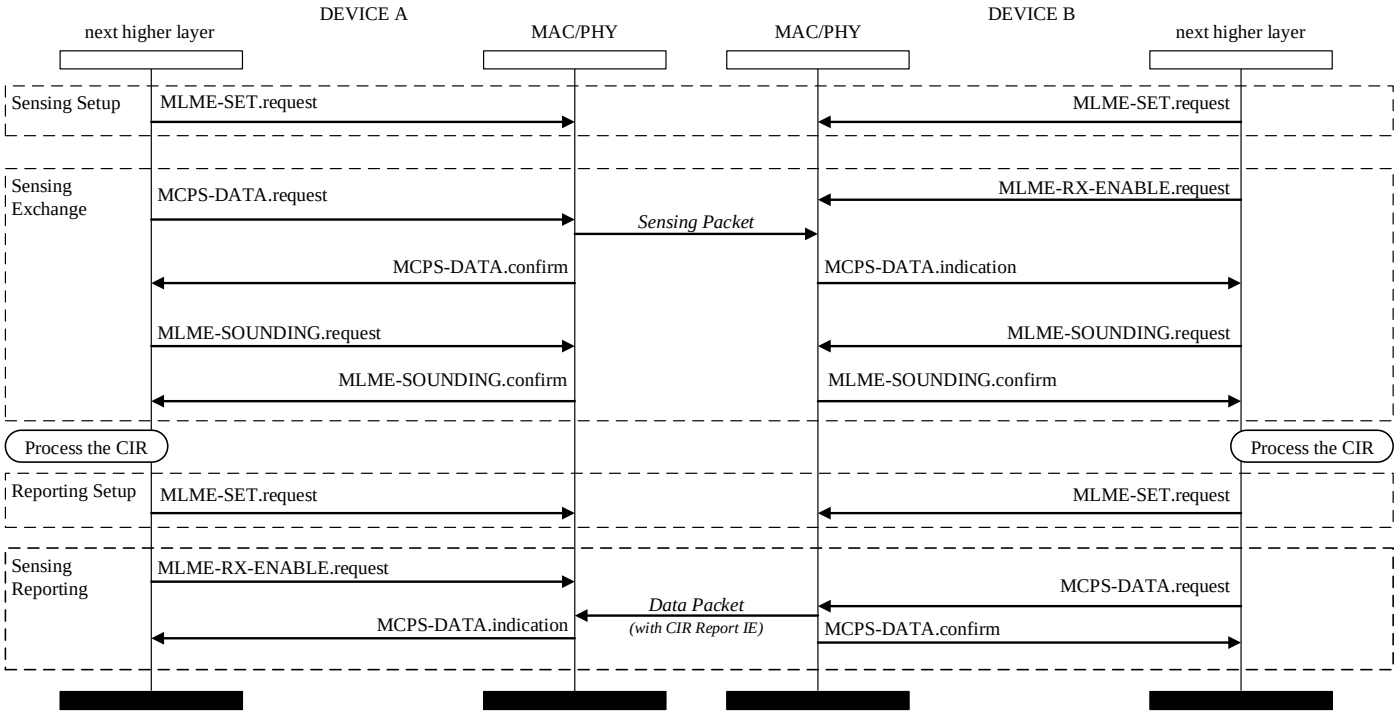

Figure A—Example message sequence chart for sensing

With reference to Figure A, the next higher layer in each device uses the MLME-SET.request primitive to configure the sensing packet format, e.g., to set *phyHrpUwbTxPacketConfig* and *phyHrpUwbRxPacketConfig* to SENS_PACKET_0 to select the SENS packet configuration zero shown in Figure 194.

The next higher layer in device B, the sensing receiver, issues an MLME-RX-ENABLE.request to turn on its receiver in good time to receive the sensing packet it is expecting as it participates in multistatic sensing, and, the next higher layer in device A, the sensing transmitter, issues the MCPS-DATA.request primitive with the SensReceive parameter set to TRUE to initiate the sensing packet transmission with its receiver also turned on so that it can perform monostatic sensing.

On device A the MCPS-DATA.confirm primitive from the MAC tells the next higher layer that the sensing packet transmission has completed. To extract the CIR data for its monostatic sensing processing, the next higher layer in device A then issues an MLME-SOUNDING.request, (with FormatSpecifier parameter value of IQ_FORMAT), and the CIR data is delivered by the MAC issuing the MLME-SOUNDING.confirm in response.

On device B the MCPS-DATA.indication primitive from the MAC tells the next higher layer that the sensing packet has been received, and the next higher layer uses the MLME-SOUNDING.request primitive to extract the CIR for its sensing processing.

For the reporting phase, the next higher layer in each device issues an MLME-SET.request primitive to reconfigure the packet format appropriately to carry the reporting phase payload, e.g., to set *phyHrpUwbTxPacketConfig* and *phyHrpUwbRxPacketConfig* to BASIC_PACKET. In the Figure A example, device B is reporting to device A. This would be done once the appropriate processing of the CIR has been completed.

The next higher layer in device A, issues an MLME-RX-ENABLE.request to turn on its receiver in good time to receive the report it is expecting from device B, and the next higher layer in device B, issues the MCPS-DATA.request to initiate the transmission of the report, e.g., sending a frame carrying the CIR Report IE. Acknowledged transmission might be used here.

On device B, the MCPS-DATA.confirm primitive issued by the MAC tells the next higher layer that the transmission has completed, while on device A, and the MCPS-DATA.indication primitive delivers the received report to the next higher.

That completes a single round of sensing. A sensing application would typically repeat the flow illustrated in Figure A at regular intervals and observe the changing CIR data to perform its sensing function.

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