

IEEE P802.15
Wireless Personal Area Networks

Project	IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)	
Title	SUN turnaround time	
Date Submitted	[September, 2010]	
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Re:	[d1P802-15-4g_Draft_Standard.pdf]	
Abstract	[This document describes changes to resolve comments regarding turnaround time.]	
Purpose	[To resolve comments in LB51.]	
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1. Overview

In IEEE Std 802.15.4-2006, the turnaround time (aTurnaroundTime) is defined in terms of symbols. The turnaround time is implicitly in the backoff slot time (aUnitBackoffPeriod), which is also defined in terms of symbols.

For the SUN PHYs, this time is better expressed in units of time. The turnaround time would be 1 ms while the backoff slot time will be the turnaround time plus the time to perform CCA detection (a new constant, aCCATime).

2. Comments and resolutions

This proposed resolution applies to the following comments as follows:

CIDs 1073, 1074, 1075, 1500, 1501, 1502, 1525, 1526, 1527, 1528, 1529, 1530, 1813:

Resolution: Accept in principle, resolve as described in 15-10-0706-00.

3. Changes

Add the following editing instruction (not all rows from d1802.15.4g are shown, just the rows modified):

Change Table 22 as shown.

Table 22—PHY constants

Constant	Description	Value
aTurnaroundTime	RX-to-TX or TX-to-RX maximum turnaround time (in symbol periods) (see 6.9.1 and 6.9.2)	<u>1 ms for the SUN PHYs.</u> <u>The duration of 12 symbol periods</u> <u>for all other PHYs.</u>
aCCATime	<u>The time required to perform CCA detection.</u>	<u>For the SUN PHYs other than MR-OQPSK, 8 symbol periods at the</u> <u>lowest mandatory symbol rate for</u> <u>that channel page.</u> <u>For the MR-OQPSK PHY, this</u> <u>value is defined in Table 75ag.</u> <u>For all other PHYs, the duration of</u> <u>8 symbol periods.</u>

Replace subclause 6.12c.6.4 with the following:

6.12c.6.4 CCA specifications

The detection time, aCCATime, for clear channel assessment (CCA) for the MR-OQPSK is shown in Table 75ag. The ED threshold shall correspond to a received signal power of at most -90 dBm, when applying CCA Mode 1 or CCA Mode 3 (see 6.13.9).

Add the following editing instruction:

Table 75ag—CCA duration for MR-OQPSK PHY

Frequency band (MHz)	aCCATime (us)
470-510	1024
779-787	512
868-870	1024
902-928	512
950-958	1024
2400-2483.5	512

Change Table 85 as shown. Rows that are not shown are unchanged.

Table 85—MAC sublayer constants

Constant	Description	Value
aUnitBackoffPeriod	The number of symbols time forming the basic time period used by the CSMA-CA algorithm.	20 <u>aTurnaroundTime + aCCATime</u>

New capability, delayed acknowledgment

Change 7.2.2.3 and 7.2.2.3.1 as shown:

7.2.2.3 Acknowledgment frame format

The acknowledgment frame shall be formatted as illustrated in Figure 1.

Octets: 2	1	2
Frame Control	Sequence Number	FCS
MHR		MFR

Figure 1—Acknowledgment frame format

The acknowledgment frame used for delayed acknowledgement, as described in 7.5.6.4.2, shall be formatted as illustrated in Figure 2.

7.2.2.3.1 Acknowledgment frame MHR fields

~~The MHR for an acknowledgment frame shall contain only the Frame Control field and the Sequence Number field.~~

In the Frame Control field, the Frame Type subfield shall contain the value that indicates an acknowledgment frame, as shown in Table 92. If the acknowledgment frame is being sent in response to a

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Octets: 2	1	variable	2
Frame Control	Sequence number	Addressing fields	FCS
MHR			MFR

Figure 2—Acknowledgment frame used for delayed acknowledgment format

received data request command, the device sending the acknowledgment frame shall determine whether it has data pending for the recipient. If the device can determine this before sending the acknowledgment frame, as described in 7.5.6.4.2, it shall set the Frame Pending subfield according to whether there is pending data. Otherwise, the Frame Pending subfield shall be set to one. If the acknowledgment frame is being sent in response to either a data frame or another type of MAC command frame, the device shall set the Frame Pending subfield to zero. All other subfields shall be set to zero and ignored on reception.

The Sequence Number field shall contain the value of the sequence number received in the frame for which the acknowledgment is to be sent.

When the acknowledgement frame is used for delayed acknowledgment, as described in 7.5.6.4.2, the destination address fields shall contain the source address fields of the frame that is being acknowledged. The source address fields shall contain the destination address fields of the frame that is being acknowledged. The Frame Control field shall be set to reflect the addressing that is used.

In the new SUN PHY Capability IE, use reserved bit 5 the Delayed Acknowledgment bit with the following definition.

The Delayed Acknowledgment field shall be set to one if the device requires the use of delayed acknowledgment, as described in 7.5.6.4.2, and shall be set to zero otherwise.

Change 7.5.6.4.2 as shown:

7.5.6.4.2 Acknowledgment

A frame transmitted with the Acknowledgment Request subfield of its Frame Control field set to one shall be acknowledged by the recipient. If the intended recipient correctly receives the frame, it shall generate and send an acknowledgment frame containing the same DSN from the data or MAC command frame that is being acknowledged.

A SUN PHY device may set the Delayed Acknowledgment bit in the SUN PHY Capabilities IE to indicate that it requires delayed acknowledgement frames. If the device indicates that it requires delayed acknowledgement frames, then it shall use the CSMA/CA method to send the acknowledgement frame.

Otherwise, tThe transmission of an acknowledgment frame in a nonbeacon-enabled PAN or in the CFP shall commence $aTurnaroundTime$ symbols after the reception of the last symbol of the data or MAC command frame. The transmission of an acknowledgment frame in the CAP shall commence either $aTurnaroundTime$ symbols after the reception of the last symbol of the data or MAC command frame or at a backoff slot boundary. In the latter case, the transmission of an acknowledgment frame shall commence between $aTurnaroundTime$ and $(aTurnaroundTime + aUnitBackoffPeriod)$ symbols after the reception of the last symbol of the data or MAC command frame. The constant $aTurnaroundTime$ is defined in Table 22 (see 6.4.1).

The message sequence chart in Figure 71 shows the scenario for transmitting a single frame of data from an originator to a recipient with an acknowledgment. In this case, the originator indicates to the recipient that it

requires an acknowledgment by transmitting the data frame with the Acknowledgment Request (AR) sub-field of the Frame Control field set to one.

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