IEEE P802.15

Wireless Personal Area Networks

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| Project | IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) | |
| Title | Changes done between DF01 and DF02 | |
| Date Submitted | 05th March 2023 | |
| Source | Tero Kivinen | E-mail: kivinen@iki.fi |
| Re: | March TG4me meeting | |
| Abstract | Provide list of changes in TG4me draft. | |
| Purpose | TG4me discussion | |
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1. Issues fixed before

Clause 3z:

Changed acronym  
RCM ranging control messsage  
vs ranging control method

Clause 5z:

Section 5.7.3, there is missing PPSU in 3rd paragraph.

Clause 6z:

Saved with newer framemaker... Images missing  
Editing of the 6.9.5 were wrong. Last paragraph was added, but not underlined, 2nd last paragraph

Clause 8z:

Table 8-28 MLME-RX-ENABLE Status has type changed from Enumeration to Enumerations, but I have no idea why. Ignored that change, but on the other hand StatusDetail has type of List of Enumeration, which I changed to List of Enumerations.

In 8.2.15.2 Table 8-38 will have extra empty line at the end when track changes are done.

Section 8.2.18.4 MLME-BEACON.indication was added as 8.2.18.3 instead of 8.2.18.4. Also added it to the Table 8-1, which was not done in 4z.  
  
Editing instructions for Table 8-71 was wrong for Timestamp description. Edited to match the end result. Same for Table 8-73, 8-89, 8-90. Some text missing underline...  
  
Table 8-92 will have some empty lines for removed rows, after track changes are done.  
  
Section 8.3.8.3 MCPS-RANGING-PROVING.indication has links to 7.5.27 and 7.5.28 but they are wrong, replaced with 7.5.31, and 7.5.32.  
6.9.8.1 has same wrong links.

Clause 23w

In 23.5.2 formula there is Cmin, Cmin + 1, ..., Cmax is the +1 to C(min+1) or (Cmin) + 1

Clause 9y

The Table 9-8a the first column is in italics, removed italics.

Annex Ay

B25 -> B10, added footnote  
B26 -> B18, added footnote  
B27 -> B24, added footnote

Annex By

The framemaker Annex B did not have Inputs: as heading, but had Inputs: text, same for Actions. Is this the latest version of Annex B.

Clause 19aa

Is the Operaring mode #11 channel spacing really 100kHz, not 1000 kHz?

Annex aa

There was no header in it, added "Channel Assignment". Added ARIB Bib reference.

1. Issues fixed in DF01 to DF02
   1. Issues in PHY PIB attributes

These are covered in the 15-23-0043-02 document. That file already lists what changes have been done.

* 1. STS key → STS seed

Changed STS key to STS seed, as the key is defined in the base standard, and the STS key use did not match that definition. This included renameing the Ranging STS Key and Data IE (RSKD IE) to Ranging STS Seed and Data IE (RSSD IE), and the SKP field in it to SSP field.

* 1. Security clause 9

Added references to *secEnhancedBeaconSecurity*\* in 9.2.2, saying those are used when sending enhanced beacons. They were not referenced before.

In section 9.2.2 step g) changed the “element of secKeyDescriptor” to “element of KeyDescriptor”. This is because the step c) fetches the KeyDescriptor, and this is where the framecounter we need to increment is stored.

Renamed secKeyDescriptor PIB attribute to *secKeyItem*, so only structures now have names with \*Descriptor prefix. s*ecKeyItem* points to secKeyDescriptor structure. Previously as both the structure and the attribute had same name it was not possible to know which one is meant.

In section 9.2.4 step g) 2) clarified that the *secKeyDeviceFrameCounter* is in an secKeyDeviceFrameCounterDescriptor structure matching the addresses. Those descriptors are stored in the *secKeyDeviceFrameCounterList*. Also renamed the secKeyDeviceFrameCounter structure to secKeyDeviceFrameCounterDescriptor to match other structures.

In section 9.2.4 step g) 3) the step returned error if the frame counter was not found. This meant a new device could not send any packets to this device before the next higher layer added the secKeyDeviceFrameCounterDesciptor. I think this is too limited. Changed it so that if device is not found for this key, then use FrameCounterCheck value of zero.

Also modified step j) to create the secKeyDeviceFrameCounterDescriptor structure if it does not exists.

In section 9.2.6 clarified that the DeviceDescriptors are in the *secDeviceList*.

Renamed *secSecurityLevelTable* to *secSecurityLevelList* to match other similar tables/lists.

In section 9.2.9 fixed a bug where it referenced *secIeType* and *secIeId*, when it should have referenced *secKeyIeType* and *secKeyIeId*. Also clarified that secKeyUsageDescriptor entry is from the *secKeyUsageList* of KeyDescriptor, and fixed another typo where *secKeyIeUsageDescriptorList* was written as *secKeyIeUsageList*.

In section 9.2.11 there was bug where it used *secFrameType* instead of *secKeyUsageFrameType*.

Split different PIB tables in the section 9.5 to separate subsections.

In section 9.5.2 the footnote was incorrectly added to AES-256-CCM, when it was supposed to be in AES-128-CCM\* and AES-128-CCM.

* 1. PICS

Added table listing all different optional groups.

Removed FD1 (FFD), FD2 (RFD), FD6 (RFD-TX), and FD7 (RFD-RX). If something was mandatory for FD1, but not others, then it was made optional (FD4 Assignment of short network address, FD5 support of short network address, PLF1 Energy detection, PLF2 Link quality indication, MLF3.1 Transmit beacons, MLF3.2 Receive beacons, MLF8 Association and disassociation, MLF10.2 Active scanning, MLF10.3 Passive scanning, MLF11 control, define, determine and declare superframe structure, MF1 Beacon, MF4.2 Association request, MF4.3 Association response, MF4.4 Disassociation notification, MF4.5 Data request, MF4.6 PAN ID conflict notification, MF4.7 Orphaned device notification, MF4.8 Beacon request, MF4.10 Coordinator realignment, ).

In some cases I was not sure what is correct leve, this includes different LRP UWB modes PLF6-PLF8, as they depended on the RF9.1 LPR UWB RFD-RX and RF9.2 LRP UWB RFD-TX which got removed.

On the other hand MLF1 Transmission of data, MLF1.1 Purge data, MLF2 reception of data, MLF6 Frame validation, MLF7 Acknowedged frame delivery, MLF10.1 ED scanning, MLF13 Store one transaction were changed to be mandatory.

In table E.14 MAC frames I added missing commands, i.e. MF4.31 Vendor Specific command, MF4.32 Ranging Verifier command and MF 4.33 Ranging Prover command.

In table E.15 MAC IEs I added the missing IEs, i.e., MIE4.33 Link Margin, MIE 4.34 RF-GFSK Device Capabilities IE, MIE4.35 Multi-PHY IE, and then all of the missing ranging IEs. For those IEs we are missing the status of them.

* 1. Remove RFD and FFD distinction, and RFD-RX and RFD-TX

Removed the FFD, RFD, RFD-RX and RFD-TX in acronym list.

Removed 3rd paragraph of 5.1 that described about the two different types of devices.

Removed 1st paragraph of 6.1 that described the two different types of devices.

Removed references to FFD and RFD throughout the standard.

In section 6.3.1.1 it is not clear what types of scanning is now mandatory This also affects PICS.

There were cases where something was optional for RFD-RX and RFD-TX devices, but mandatory for others, I removed those references of those features being optional. In most cases those features will be optional in any case.

Features that used to be optional for RFD: PAN ID conflict resolution, MAC commands with command ID 0x01-0x08, Association Request (reception), Assocation Response (tranmission), Disassociation Notification, Data Request command (reception), PAN ID Conflict Notification (reception), Orphan Notification (reception), Beacon request command, Coordinator Realignment command (transmission).

Removed RFD column from the MAC commands table.

Mandated that Device type should be set to one in Assocation Request command, as we do not have FFDs and RFDs anymore.

Lots of MLME primitives and MAC PIB attributes are now marked as optional, as anything that was optional for RFDs is now marked optional.

* 1. Coordinator vs device

I think we still need the term coordinator, but we should define it to mean a device that sends out beacons, and change every other types of uses of coordinator to device. The PAN coordinator is kept as it is.

For example keep 5.7.2.1 where it talks we have “transfer to coordinator in which a device transmits the data”, this should be kept as it is.

i.e. coordinator can have following roles:

* Sending beacons
* Association / disassociation
* Indirect data transfer
* GTS management

PAN coordinator allocates the PAN ID

* 1. CSMA-CA algorithm

Removed following text from 6.2.5.1:

The CSMA-CA algorithm shall not be used for the transmission of Beacon frames in a beacon-enabled PAN, Imm-Ack frames, Enh-Ack frames, or Data frames transmitted in the CFP.

* 1. Beacon generation

Removed following paragraph in 6.3.4 Beacon generaton:

A device shall be permitted to transmit Beacon frames only if macShortAddress is not equal to 0xffff.

* 1. Transmission

Changed:

Each time a Data frame or a MAC command is generated, the MAC sublayer shall copy the value of macDsn into the Sequence Number field of the MHR of the outgoing frame and then increment it by one

to

Each time a Data frame or a MAC command frame with Sequence number field is generated, the MAC sublayer shall copy the value of macDsn into the Sequence Number field of the MHR of the outgoing frame and then increment it by one.

Change:

The value of macDsn shall be permitted to roll over.

To:

The value of macDsn shall roll over upon reaching the maximum value representable in the Sequence Number field.

Same change for macBsd and macEbsdn fields.

Removed:

, and transmissions in a GTS shall not use CSMA-CA

* 1. Reception and rejection

Changed:

The MAC sublayer shall, therefore, be able to filter incoming frames and present only the frames that are of interest to the next higher layer.

To:

The MAC sublayer will, therefore, be able to filter incoming frames and send only the frames that are of interest to the next higher layer.

Changed:

If the frame type indicates that the frame is a Beacon frame, the source PAN ID shall match macPanId unless macPanId is equal to the broadcast PAN ID, in which case the Beacon frame shall be accepted regardless of the source PAN ID.

To:

If the frame type indicates that the frame is a Beacon frame and the source PAN ID is present, the source PAN ID shall match macPanId unless macPanId is equal to the broadcast PAN ID, in which case the Beacon frame shall be accepted regardless of the source PAN ID.

* 1. Retransmissions

Changed:

If an Ack frame is received within the expected time and contains the same DSN as the original transmission, the transmission is considered successful, and no further action regarding retransmission shall be taken by the device.

To:

If an Ack frame is received within the expected time and contains the same DSN, if present, as the original transmission, the transmission is considered successful, and no further action regarding retransmission shall be taken by the device.

* 1. aCcaTime and phyCcaDuration

Remove aCcaTime, and replaced it with phyCcaDuration through out the standard.

* 1. aUnitBackoffPeriod vs macUnitBackoffPeriod

Changed aUnitBackoffPeriod to be macUnitBackoffPeriod with description of

The number of symbols forming the basic time period used by the CSMA-CA algorithm.

And with default value of:

*aTurnaroundTime* + *phyCcaDuration*

Type is integer, but I have no idea what the range should be. I think minimum is around 4 or 8 symbols, but maximum can be 1 ms or similar, thus unknown number of symbols.

* 1. aMaxPhyPacketSize

This is not constant, so renamed to *phyMaxPacketSize*, type integer, range 16-4095, description:

The maximum PSDU size (in octets) the PHY shall be able to receive.

This is 2047 for the following PHYs: SUN, TVWS, RCC, LECIM FSK, and MSK with a 2000 kb/s data rate. For LECIM DSSS PHY, refer to phyLecimDsssPsduSize. For the HRP UWB PHY, refer to phyHrpUwbPsduSize.

127 for all other PHYs.

* 1. Association

In 6.4.1 remove following sentence from Table 6-4 describing short address of 0xffff:

The device is not associated and, therefore, shall not perform any Data frame communication.

Changed ”next higher layer shall attempt” to ”next higher layer will attempt”.

Changed ”next higher layer shall request” to ”next higher layer will request”.

Changed ”next higher layer shall try to associate… and shall not attempt” to ”next higher layer tries to associate … and will not attempt”

* 1. ChannelPage

Created a table listing all channel pages, and removed them from the section 10.

|  |  |  |  |
| --- | --- | --- | --- |
| List of Channel pages | | | |
| **Channel Page** | **PHY** | **Band** | **Description** |
| 0 | BPSK | 868 MHz, 915 MHz | Channels defined in IEEE Std 802.15-4-2003. |
| O-QPSK | 2450 MHz |
| 2 | O-QPSK | 868 MHz, 915 MHz |  |
| 3 | CSS | 2450 MHz |  |
| 4 | UWB |  |  |
| 5 | O-QPSK | 780 MHz |  |
| 7 | MSK | 433 MHz, 2450 MHz |  |
| 8 | LRP UWB |  |  |
| 9 | SUN PHYs |  |  |
| 10 | SUN FSK Generic PHY |  |  |
| 11 | O-QPSK | 2380 MHz |  |
| 12 | LECIM PHY |  |  |
| 13 | RCC PHY |  |  |

* 1. Open issues

Table 10-7 refers to ASK, should it be TASK?

Section 10 list of phys do not include RS-GFSK or TASK.

GFSK PHY on 920 Mhz band does not have channel page.

TVWS PHYs do not have channel page. The frequencies are listed in the same section than SUN PHYs, but the channel pages are only allocated for SUN PHYs.

CMB PHYs do not have channel page.

TASK PHY does not have channel page.

RS-GFSK does not have channel page.