Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)

Submission Title: [Resolution for Switching Comments]
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Re: [Comment Resolution for TG4g draft]

Abstract: The presentation provides resolution for some switching related comments

Purpose: Presented to the 802.15.4g SUN Task Group for consideration and discussion

Outline

- Comments to be resolved:
  - CID# 745, 747, 763, 766, 770, 859, 862, 863, 864, 865, 919, 920, 921, 923, 926, 929, 930, 932, 933, 934, 935, 936, 937, 941, 942, 945, 947, 948, 949, 953, 957, 958, 959, 987, 988, 1115, 1116, 1200, 1201, 1202, 1209, 1210, 1211, 1212, 1278, 1281, 1282, 1283, 1284, 1285, 1288, 1289, 1291, 1292, 1293, 1294, 1295, 1296, 1302
- Recommend Resolution
- Resolution Detail

Comments & Recommend Resolution

- CID# 745:
  - Comment: 6.2.1.1.1, p. 25, l. 46-51: Some of the parameters (e.g.,, ModeSwitchParameterEntry) seem to suggest transitory management functionality between subsequent frames. With most functionality thus far defined with 802.15.4-2006, all operations are ‘atomic’ and do not depend on previous communications (with the exception of the ACK command). It is completely unclear what the impact of a failure of the PD-DATA.request primitive would be. Why not make all changes relevant for the frame of interest instead of some frame in the future? Suggested remedy: Make parameters of PD-DATA.request primitive operate on the frame in question and *not* on some future frame
  - Recommend Resolution: Accept in principle
  - Resolution Detail: Part of the resolution is documented in doc 15-10-0733-01 and also change the Description in line 19-23 of Table 8 from
    - "A value of TRUE indicates that a mode switch will occur with the next PPDU. A value of FALSE indicates that a mode switch will not occur with the next PPDU (i.e., the current mode will be used for the following PPDU)"

    to
    - "A value of TRUE indicates that a mode switch occurs after the current PPDU. A value of FALSE indicates that a mode switch shall not occur. (i.e., the PHR and the PHY payload have the same mode)".

    Also, change line 4-5 of page 27 from
    - "If the ModeSwitching parameter of the PD-DATA.request primitive specifies that a mode switch is to occur before transmitting the next PPDU but the feature is not supported..."

    to
    - "If the ModeSwitching parameter of the PD-DATA.request primitive is TRUE but the feature is not supported...".

Comments & Recommend Resolution (Cont'd)

- CID# 747:
  - Comment: Amendment to PD-DATA.request appears to be focused on the MR-FSK PHY. But both, the OFDM PHY and the MR-O-QPSK PHY support mode change too. This is accomplished in a traditional fashion, by passing mode information in the PHR field, and transmitting at this data rate during PSDU. (Description of Mode switch mechanism should be distinguished between MR-FSK and the other SUN PHYs. Alternatively, add appropriate parameters to PD-DATA.request taking mode information into account.)
  - Recommend Resolution: Accept in principle.
  - Resolution Detail: The mode switch mechanism is described in FSK related clauses. No change is needed.
- CID# 763:
  - Comment: Combine "modeSwitching" and "modeSwitchParameterEntry" using some value to indicate "none". Also, the name is misleading sounds like it contains a set of parameters (description of the mode as described in 6.12.a.3) when what I think is meant is that it is an index into a table of possible modes to switch to. (Clarify or delete mode switching parameters)
  - Recommend Resolution: Accept in principle.
  - Resolution Detail: The clarification is given in doc 15-10-0733-01.

Comments & Recommend Resolution (Cont'd)

- CID# 766:
  - Comment: "before transmitting the next PPDU" is not clear. The mode switch essentially requires that the PSDU is now split into multiple (2) PPDUs, the first consisting of a PHR with mode switch information, and then the PPDU that
  - Recommend Resolution: Accept in principle.
  - Resolution Detail: The mode switch PPDU sequence is defined in doc 15-10-0733-01.
- CID# 770:
  - Comment: Add a boolean indicating a mode switch and a Mode switch Parameter Entry, as defined in table 8, clause 6.2.1.1.1.
  - Recommend Resolution: Reject.
  - Resolution Detail: Since mode switch is done on a packet by packet basis, mode switch is handled by PHY layer at the receiver. In the receiver, no mode switch parameters are needed to be communicated to MAC or higher layer.
- CID# 859:
  - Comment: Figure 27a appears to describe the packet control field only when mode switch field == 0. When ==1 a different PPDU format is indicated.
  - Recommend Resolution: Accept in principle
  - Resolution Detail: This comment is resolved by doc 15-10-0592-00.

Comments & Recommend Resolution (Cont'd)

- CID# 862:
  - Comment: The Mode Switch sub-field is described as being part of both the Packet Control and Switching fields. A sub-field cannot be common to multiple fields.
  - Recommend Resolution: Accept in principle.
  - Resolution Detail: This comment is resolved by doc 15-10-0592-00.
- CID# 863:
  - Comment: I think the packet structure would be cleaner if the Mode Switch subfield was changed to a field. That is, the Mode Switch should not be contained within the Packet Control field or the Switching field.
  - Recommend Resolution: Accept in principle
  - Resolution Detail: This comment is resolved by doc 15-10-0592-00.
- CID# 864:
  - Comment: "the entire packet" is inconsistent language. Two packet forms have been defined - one with mode switch == 0 and that one contains a PSDU. The other with mode switch == 1 contains no PSDU but contains only mode switching parameters. "shall be transmitted" also implies that setting a bit in the PHR controls the transmitter, which is not right..
  - Recommend Resolution: Accept in principle
  - Resolution Detail: This comment is resolved by doc 15-10-0592-00.

Comments & Recommend Resolution (Cont'd)

- CID# 865:
  - Comment: There is no header protection (cf FCS field definition in 7.2.1.9) and there is no packet protection for the mode switch frame (as defined in figure 26b). When bit error will happen on the mode switch bit, the receiver will switch to a random mode and the consequence would be very bad for the system. The mechanism for mode switching "on the fly" are not robust enough and could cause a security threat (denial of service attack).
  - Recommend Resolution: Reject.
  - Resolution Detail: There are error detection mechanism in the mode switch frame defined in Figure 26b. If an error occurs in the Mode Switch bit, it will be either detected or cause a false mode switch in the receiver side. If a false mode switch occurs, the receiver will not be able to detect the packet and will go back to idle mode after receiver time out, which is no different than missing a normal packet.

Comments & Recommend Resolution (Cont'd)

- CID# 919:
  - Comment: The sub-clauses on Mode Switching such as 6.3.3a require further clarification, e.g. a state dependency is introduced at the PHY between consequtive packets, such as with the bit signaling the New Mode FEC; in light of this dependency, who controls and how are the PHY states at the receiving device managed?
  - Recommend Resolution: Accept in principle
  - Resolution Detail: PHY states at the receiving device could be modified by the parameters in the mode switch packet. Further clarification is documented in doc 15-10-0733-01.
- CID# 920:
  - Comment: A single bit error can cause the device to switch modes causing communication failure.
  - Recommend Resolution: Reject
  - Resolution Detail: A single bit error in "FCS Length" or "Data Whitening" can cause the receiver switch to wrong mode as well but it doesn't prevent us from using "FCS Length" or "Data Whitening". Also, the receiver can take advantage of the BCH code and the parity check bit to detect/correct bit error in mode switch. A mode switch communication error caused by a bit error is no different from communication error from any PPDU. If an error occurs in the mode switch bit, the receiver can be aborted once the bit error is detected by BCH code or parity check bit. Other bit errors can be detected once the full PPDU is received.

Comments & Recommend Resolution (Cont'd)

- CID# 921:
  - Comment: Switching mode and this packet are not suitable as defined. At low PSR packets may be dropped for a single bit error, despite havier protections like FEC. Too much riding in this single bit.
  - Recommend Resolution: Reject
  - Resolution Detail: Resolution same as CID# 920.
- CID# 923:
  - Comment: The design of the mode switching packet is flawed. The root of the problem is the Mode Switch bit that dictates how the rest of the frame is to be interpreted. When Mode Switch is 1, the Mode Switch FEC is used on the header. The sensitivity of the header decoding is therefore bound by this bit in its uncoded form. As a result, the Mode Switch FEC does not provide the intended gains.
  - Recommend Resolution: Accept in principle
  - Resolution Detail: An implementer can utilize the BCH code and the parity check bit to provide certain protection for mode switch bit. No change is needed.

Comments & Recommend Resolution (Cont'd)

- CID# 926:
  - Comment: What is the point of the "mode switch parameter entry" in the PHR as from the xref description, these parameters only affect how the packet is transmitted and are not needed in the receiver.
  - Recommend Resolution: Reject
  - Resolution Detail: "mode switch parameter entry" is also needed in the receiver to instruct the receiver how to switch modes to receive the PSDU.

Comments & Recommend Resolution (Cont'd)

- CID# 929:
  - Comment: The "New mode FEC" subfield is not needed. SFD value indicates if coding is used or not.
  - Recommend Resolution: Reject
  - Resolution Detail: Since the second SFD is optional, the "New mode FEC" subfield is still needed.
- CID# 930:
  - Comment: bit for FEC should not be necessary
  - Recommend Resolution: Reject
  - Resolution Detail: Resolution same as CID# 929.
- CID# 932:
  - Comment: The New Mode FEC sub-field is described as being overridden by an SFD indicating FEC. Is the sub-field also overridden by an SFD indicating no FEC? If not what is the meaning of the combination New Mode FEC=1 and SFD.
  - Recommend Resolution: Accept in principle
  - Resolution Detail: If a second SFD exists, the New Mode FEC field will be overwritten by the SFD regardless whether the SFD indicates coding or uncoding. No change is needed.

Comments & Recommend Resolution (Cont'd)

- CID# 933:
  - Comment: "If the new mode packet has an SFD..." Do we really want to send a packet with no SFD? The idea that a packet may not have an SFD is not clearly explained or illustrated in 6.3. This is confusing.
  - Recommend Resolution: Accept in principle
  - Resolution Detail: The purpose of SFD is to assist the initial synchronization. For a simple mode switch such as changing the modulation order from two to four, mostly likely a second SFD can be omitted. No text change is needed.
- CID# 934, 935, 936, 937:
  - Comment: There is not a need to have the new mode FEC flag overridden by the new mode packet SFD.
  - Recommend Resolution: Reject
  - Resolution Detail: The "new mode FEC" is needed when there is no second SFD.

Comments & Recommend Resolution (Cont'd)

- CID# 941:
  - Comment: The New Mode sub-field description indicated the Mode sub-field is an index into phySUNPageEntriesSupported. However, the phySUNPageEntriesSupported data structure permits an entry to declare up to 16 modes to be supported and so the Mode sub-field of the New Mode sub-field is ambiguous or the same field is described for two different purposes simultaneously.
  - Recommend Resolution: Accept in principle
  - Resolution Detail: Resolution is documented in doc 15-10-0733-01.

Comments & Recommend Resolution (Cont'd)

- CID# 942:
  - Comment: The "mode" bits of the "new mode" subfield index into a table of local device capabilities. The definition of phySUNPageEntriesSupported says it each entry contains "channel page definitions", which contains a band, a modulation type, and a bit map that specifies all the PHY modes supported in that band/mod type in that device. It doesn't tell me which of those modes you intend to switch to. Further, two different devices may have completely different capabilities and so the index into phySUNPageEntriesSupported likely means something totally different in different devices (this PIB attribute describes the implementation, thus must be read only).
  - Recommend Resolution: Accept in principle
  - Resolution Detail: Resolution same as CID# 941.
- CID# 945:
  - Comment: The 16 possible modes in the Mode field on the New Mode subfield refer to the index for the phySUNPageEntriesSupported array. It is not clear how this array is maintained to be the same at the transmitter and receiver.
  - Recommend Resolution: Accept in principle
  - Resolution Detail: Part of the resolution is the same as CID# 941. Part of the resolution is the same as CID# 924.

Comments & Recommend Resolution (Cont'd)

- CID# 947:
  - Comment: "The Mode Switch FEC subfield specifies the" is confusing. The field actually IS the error correction (BCH) bits,right?
  - Recommend Resolution: Accept in principle
  - Resolution Detail: Yes, the Mode Switch FEC subfield is the combination of BCH codes and a parity bit. Change the "Mode Switch FEC subfield" into "Checksum" field and "Parity Check" field as shown in doc 15-10-0733-01.
- CID# 948:
  - Comment: Is the parity bit over the entire PHR, just the BCH, or something else?
  - Recommend Resolution: Accept in principle
  - Resolution Detail: The parity bit is for the first eleven bits of the PHR and is clarified in doc 15-10-0733-01.
- CID# 949:
  - Comment: Polarity of parrity bit is not specified.
  - Recommend Resolution: Accept in principle
  - Resolution Detail: The polarity of parity bits are specified in doc 15-10-0733-01.

Comments & Recommend Resolution (Cont'd)

- CID# 953:
  - Comment: It is not clear what order the bits/bytes from the Mode Switching field are transmitted over the air.
  - Recommend Resolution: Accept in principle
  - Resolution Detail: Resolved by doc 15-10-0558-01.
- CID# 957:
  - Comment: How does the receipt of a Mode Switch PPDU override the PHY PIB parameters controlling the local (receiver) PHY operation? If for example the PHY PIB attribute phyCurrentPage is set to 7 and the New Mode indicates Page 8 – how is the PIB attribute "suspended"?
  - Recommend Resolution: Reject
  - Resolution Detail: This is implementation issue. Also, the mode switch only applies to the PPDU transmitted immediately after the mode switch PPDU. After that PPDU is received or a timeout occurs, the receiving device returns to the mode specified by the PHY PIB attributes. For detail please reference to doc 15-10-0733-01.

Comments & Recommend Resolution (Cont'd)

- CID# 958:
  - Comment: The PHY PIB attribute phyCurrentChannel is set for the device operation and corresponds to a specific centre frequency. The Mode Switch provides a means to change the PHY Mode (if corrected) but not the channel number. When the PHY Mode is changed, the phyCurrentChannel value may not correspond to the current centre frequency. How is the PHY to interpret phyCurrentChannel during Mode Switch operation?
  - Recommend Resolution: Accept in principle
  - Resolution Detail: The channel number does not change for a mode switch and channel alignment is assumed between the two PHY modes used in the mode switch operation. This is documented in doc 15-10-0733-01.
- CID# 959:
  - Comment: ModeSwitchParamterEntry is not clear. How is sync without an SFD possible? Also, there is an issue related to FEC of the MR-FSK PHY. Since PHR and PSDU are encoded as a single block, termination of the convolutional code cannot be utilized, if the length of the code sequence cannot be extracted. Additional ModeSwitchFEC is not useful, since it depends on a-priory knowledge of an unprotected information bit.
  - Recommend Resolution: Accept in principle
  - Resolution Detail: The coding scheme for mode switch PPDU is BCH not convolutional encoding. A-priory knowledge is not required as the information is all part of one transmission initiated by a PD-DATA.request primitive. No change is needed.

Comments & Recommend Resolution (Cont'd)

- CID# 987, 988:
  - Comment: why there are no PSDU or MHR in the mode switch PPDU. Source address can tell the nodes the mode switch from which coordinator or which PAN, no source address may disrupt other PAN. Destination address can tell specific node to change the mode, no destination address make the mode swtich must do in the whole network, not just for node-to-node link. FCS can ensure the transmission data, avoid mistake command, no FCS can be result to wrong mode switch
  - Recommend Resolution: Reject
  - Resolution Detail: The mode switch PPDU is similar to an additional PHR and is defined not to have a PSDU. Since the transmission of mode switch PPDU and the following PPDU is equivalent to a single transmission, only devices that can support the mode switch would continue reception. When receiving the PPDU with the MAC header, the receiver can decide to disregard the packet based on destination address information. This is no different from any other PPDU except for the minimal extra time required for the secondary synchronization header and PHY header.
- CID# 1115:
  - Comment: Is this also read only? Is it set by the NHL (and if so, how does it know what to set it to?) or is it describing characteristics of a specific implementation?
  - Recommend Resolution: Accept in principle
  - Resolution Detail: phyModeSwitchParameterEntries is set by the NHL and describes characteristics of a specific implementation.

Comments & Recommend Resolution (Cont'd)

- CID# 1116:
  - Comment: Is there a list of mode switch parameter entries? How is this defined?
  - Recommend Resolution: Accept in principle
  - Resolution Detail: An example of mode switch parameter entries is given in doc 15-10-0733-01. Mode switch parameter entries are defined by the NHL. How the mode switch parameter entries are coordinated between two devices is an implementation issue of the system integrator.
- CID# 1200:
  - Comment: The term "secondary PPDU" is used here but not anywhere else in the draft.
  - Recommend Resolution: Accept in principle
  - Resolution Detail: Change "secondary PPDU" to "following PPDU".
- CID# 1201:
  - Comment: secondary preamble length is not necessary.
  - Recommend Resolution: Reject
  - Resolution Detail: The secondary preamble length adds flexibility and provides options for simple mode switches (e.g. 2-level to 4-level FSK) w/o a secondary preamble or mode switches that require a secondary preamble.
- CID# 1202:
  - Comment: secondary preamble is not necessary.
  - Recommend Resolution: Reject
  - Resolution Detail: Resolution same as CID# 1201.

Comments & Recommend Resolution (Cont'd)

- CID# 1209:
  - Comment: Too much flexibility on settling delay is not good for interoperability.
  - Recommend Resolution: Reject
  - Resolution Detail: Certain flexibility in the settling delay doesn't prevent implementers from restricting the values to a subset of what is possible.
- CID# 1210:
  - Comment: Secondary preamble can be skipped.
  - Recommend Resolution: Reject
  - Resolution Detail: Resolution same as CID# 1201.
- CID# 1211:
  - Comment: Table 31b: secondarySFD should not be optional.
  - Recommend Resolution: Reject
  - Resolution Detail: Making the second SFD optional doesn't prevent an implementer to always have second SFD. Also, making second SFD optional allows a synchronized device to skip a second SFD.
- CID# 1212:
  - Comment: Secondary SFD can be skipped.
  - Recommend Resolution: Reject
  - Resolution Detail: Resolution same as CID# 1211.

Comments & Recommend Resolution (Cont'd)

- CID# 1278:
  - Comment: Mode Switch is optional. What is the default value for the mandatory mode?
  - Recommend Resolution: Accept in principle
  - Resolution Detail: Since mode switch is optional, the mandatory mode is non mode switch. No change is needed.
- CID# 1281:
  - Comment: Mode Switching to a new mode like OFDM on every frame can be inefficient and have worse performance than the new mode it is trying to switch to.
  - Recommend Resolution: Reject
  - Resolution Detail: Since mode switch is optional, an implementer can choose not to use it and use higher layer to do mode switch.
- CID# 1282:
  - Comment: Document says: " ...change its mode of operation in the following frame to the new mode…" The description of this change shows clearly that the next so-called frame is in fact the same frame at different mode. This distinction is praticularily important if we are dealing with FH where the next frame may require next channel, etc.
  - Recommend Resolution: Accept in principle
  - Resolution Detail: The following PPDU is always on the same channel as the mode switch PPDU. Also, the name of the following frame makes more sense. No change is required.

Comments & Recommend Resolution (Cont'd)

- CID# 1283:
  - Comment: "When changing from the current operating mode to the new mode, a settling delay, ... may exist."
  - Recommend Resolution: Accept in principle
  - Resolution Detail: Clarification is documented in doc 15-10-0733-01.
- CID# 1284:
  - Comment: The settling delay between the mode switch packet and the packet at the new mode needs to be standardized to avoid interoperability issues.
  - Recommend Resolution: Reject
  - Resolution Detail: Resolution same as CID# 1209.
- CID# 1285:
  - Comment: The fact that the secondary SFD can be optional can lead to interoperability issues since a receiving device would have no knowledge whether it needs to search for that SFD prior to demodulating the rest of the frame.
  - Recommend Resolution: Reject
  - Resolution Detail: From the mode switch packet, receiver knows whether a second SFD is present or not before demodulating the second SFD.

Comments & Recommend Resolution (Cont'd)

- CID# 1288:
  - Comment: Question: is the modulation scheme the only thing that can change?
  - Recommend Resolution: Accept in principle
  - Resolution Detail: The parameters that can be changed are in the new mode field (Table 27d). No change is needed.
- CID# 1289:
  - Comment: "The channel number and frequency band are not changed by the mode switch mechanism." If this action is not allowed, use stronger language.
  - Recommend Resolution: Accept in principle
  - Resolution Detail: Change ""The channel number and frequency band are not changed by the mode switch mechanism." to "The channel number and frequency band shall not be changed by the mode switch mechanism.".
- CID# 1291:
  - Comment: Why is channel alignment important? Is this informative or normative.
  - Recommend Resolution: Accept in principle
  - Resolution Detail: The channel alignment is important to maintain the same channel number and center frequency after mode switch.

Comments & Recommend Resolution (Cont'd)

- CID# 1292:
  - Comment: after "Table 75d" add: "Table 75d lists the channel center frequencies for the various PHY modes.
  - Recommend Resolution: Accept in Principle. After "Table 75d" add: "Table 75d lists the channel center frequencies for the various modulation schemes."
- CID# 1293:
  - Comment: Table 75a: the OFDM mode defines a 5 standard modes with channel spacing as low as 100KHz.
  - Recommend Resolution: Accept in principle
  - Resolution Detail: According to doc 15-10-0605-02, OFDM has the same channel plan as FSK. No change is needed.
- CID# 1294:
  - Comment: Table 75d doesn't seem to explain anything new. The channelization is defined elsewhere in the draft, there is no need to repeat it here.
  - Recommend Resolution: Accept in principle
  - Resolution Detail: Table 75d provides the channel number and center frequency where mode switch between different modulation schemes can take place. In addition, the mode switch is only allowed to occur when the two modes share a common channel scheme and the channel center frequency is not changed between the mode switch PPDU and the following PPDU. This is emphasized in doc 15-10-0733-01. Keep Table 75d.

Comments & Recommend Resolution (Cont'd)

- CID# 1295:
  - Comment: How is Table 75d related to the Mode switch mechanism? Is it referring to CSM? Is it desirable to have a common channel spacing of 400 kHz for all subPHYs?
  - Recommend Resolution: Accept in principle
  - Resolution Detail: Resolution same as CID# 1294.
- CID# 1296:
  - Comment: Consider moving the examples in Figures 65i, 65j to an informative annex.
  - Recommend Resolution: Accept in principle
  - Resolution Detail: Per resolution of CID# 1307, Figure 65i and the text in line 29-31 of Page 54 are deleted. Figure 65j has been reformatted and moved to 6.3a with the name of the next PPDU.
- CID# 1302:
  - Comment: Figure 65j: secondarySFD should not be optional.
  - Recommend Resolution: Reject
  - Resolution Detail: Resolution same as CID# 1211.

Questions?