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

Submission Title: Proposed resolutions to Dev-Dev comments of LB#87

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Re: [802.15 TG4m LB#87]

Abstract: Proposed resolutions for comments on technical issues of D2D of LB#87

Purpose: To propose resolutions for comments on technical issues of D2D of LB#87

CID 23

- 4.5.2.4, P9, L23
  - “Direct device-to-device data transfer enables data transfer in a GTS between two or more neighbor devices directly on a beacon-enabled PAN.”
- Comment
  - direct device data transfer is not limited in GTS
- Proposed change
  - remove "in a GTS"
- Proposed solutions
  - **Accept**

CID 48

- 5.1.6.7.1, P14, L2
  - "Neighbor discovery is to discover one-hop neighbor devices and to be discovered by neighbor devices. In this amendment, a one-hop neighbor device is a device in communication range and has the same coordinator."
- Comment
  - What happens if a device has a neighbor which is in another cluster using different coordinator with a better communication range? Are we limiting this to communicate only in a particular cluster?
- Proposed change
  - Please explain and make changes accordingly. Remove the limitations.
- Proposed solutions
  - **Accept in Principle**
  - **Combine the two sentences on page 14, line 1 to 3, to "Neighbor discovery is to discover one-hop neighbor devices and to be discovered by neighbor devices within one-hop communication range."**

CID 58

- 5.1.6.7.1, P14, L16
  - "A Neighbor Discovery command can be broadcast by a device after association with its coordinator, at the appropriate time upon receiving MLME-NBR.Request primitive from the next higher layer."
- Comment
  - Is there an assumption being made that, a neighbor discovery process can't be used for association between the device and a coordinator ? Or when a new device powers on in the network, the device may need to discover neighbor to associate with neighbor?
- Proposed change
  - Please clarify and make changes accordingly.
- Proposed solutions
  - **AP**
  - **Neighbor discovery in this proposal is not used for a device to associate with a coordinator. It is used to discover neighbors nearby for data transfer only.**
  - **Remove text "after association with its coordinator," page 14, line 17, to minimize confusing.**

CID 61

- 5.1.6.7.1, P14, L28
  - "Upon receiving a Neighbor Discovery command, a device ignores it if the source device is not associated with the same coordinator. Otherwise, it adds the source device into its neighbor list if the source device is not included."
- Comment
  - Should the source device address be added to the neighbour list or is how the source device presence is recorded an implementation decision?
- Proposed change
  - Clarification required
- Proposed solutions
  - **AP**
  - **If the neighbor is associated with the same coordinator, yes, the source address should be added to the neighbor list. Otherwise, the source address should not be added to the neighbor list.**
  - **Modify the sentence on page 14, line 28 to "A device ignores a received Neighbor Discovery command and does not include the source device in neighbor list, if the source device is not associated with the same coordinator."**

CID 64

- 5.1.6.7.1, P14, L29
  - "If the device is not listed in the Address List field of Neighbor Discovery command, it means that the device is not discovered by the source device as one-hop neighbor device."
- Comment
  - The reason provided here may not be true. It could be possible that the device may have lost the connection with the neighbor deivce and the device address is being removed by the neighbor device.
- Proposed change
  - Please clarify and make changes to the sentence accordingly.
- Proposed solutions
  - **AP**
  - **change the sentence "it means that … one-hop neighbor device." to "it means that the device is currently not discovered by the source device as one-hop neighbor device".**

CID 70, 71, 72

- 5.1.6.7.1, P14, L1 to 3
  - "Neighbor discovery is to discover one-hop neighbor devices and to be discovered by neighbor devices. In this amendment, a one-hop neighbor device is a device in communication range and has the same coordinator."
- Comment
  - Neighbor discovery should not prevent a device from discovering any (one radio hop) neighbors from an existing adjacent PAN (PANs with different coordinators). Current specification of the neighbor discovery prevents a node from discovering nodes from adjacent PANs. This can drastically limits the system performance, in terms of latency of discovering neighbors from adjacent PANs; a node should be allowed to discover any existing adjacent PAN (while registered with a given PAN) to speed up the process of joining a new PAN, when its current PAN fails.
- Proposed change
  - While registered with a given PAN, allow nodes to discover one-hop neighbors from any adjacent PANs.
- Proposed solutions
  - **Reject**
  - **To minimize operation complexity and possible interference to beacon transmission of a adjacent PAN, the proposed direct device-to-device data transfer is limited between devices with a same coordinator. So neighbor discovery is limited between devices with a same coordinator.**
  - **Please note the difference between "to discover a neighbor device" and "to discover an adjacent PAN".**

CID 73, 74

- 5.1.6.7.2 P14, L52 to 54
- Comment
  - The following text “In Probe-mode direct data transfer, if a device has data for a neighbor device and it knows that the receiver status of the neighbor device is “on”, the device sends data to the destination device at the appropriate time, without probing the receiver status of the neighbor device” is in contradiction with the Figure 22cb.
- Proposed change
  - Fix which of them is wrong: the figure or the text.
- Proposed solutions
  - **AP**
  - **Move the sentence "The message sequence of Probe-mode direct data transfer is shown in Figure 22cb." to the end of the paragraph "If the status of the neighbor device is unknown…it sends the data at appropriate time."**
  - **Remove text "In Probe-mode data transfer," at line 52, page 14**

CID 75, 76

- 5.1.6.7.1, P15, L24
  - "If the receiver status of the neighbor device is unknown, it sends a Probe command to the destination device and starts a timer with duration of *macACKWaitDuration*."
- Comment
  - #75: ". . . it sends a Probe command . . ." What is "it"?
  - #76: Does "it" refer to source device? Make explicit
- Proposed change
  - #75: Change to, ". . . the device sends a Probe command . . ."
  - #76: eg "…neighbor device is unknown, *the source device* sends a Probe command…"
- Proposed solutions
  - **#75: Accept**
  - **#76: as resolved by #75**

CID 78

- 5.1.6.7.2, P15, L25
  - "If the receiver status of the neighbor device is unknown, it sends a Probe command to the destination device and starts a timer with duration of *macACKWaitDuration*."
- Comment
  - This clause repeats behaviors already defined in the base standard: After transmitting any frame transmitted with the AR field TRUE will wiat for macACKWaitDuration for a response; acknowldge behavior is defined already; response ot the AR field set is already defined; if the retry count is greater than zero, the unsuccesfully sent frame will be sent again (i.e. remains in the transaction que), etc.
- Proposed change
  - Remove redundant repitition of normative behaviors.
- Proposed solutions
  - **AP**

CID 78 (cont.)

- **1. Remove text "and starts a timer with duration of *macACKWaitDuration*.", "before expiration of the timer." (line 26, page 15), "before expiration of the timer" (line 27, page 15).**

  2. Add "with the AR field set to request an acknowledgement." at the end of the first sentence at line 24, page 15.

  3. Add "if necessary" between "...a Probe command" and "to the neighbor device..." at line 24, page 15

  Note: then the first sentence becomes "If the receiver status of the neighbor device is unknown, the device sends a Probe command if necessary to the neighbor device with the AR field set to request an acknowledgement.

CID 79

- 5.1.6.7.2, P15, L25 (5.1.6.7.2 Probe-mode direct data transfer)
- Comment
  - The purpose of the probe and when it is invoked is unlcear. The advantage of a probe/resopnse protocol is when the data message is much larger, and consumers more time on air, than the probe/response, so that failure can be detected earlier and less time spent transmitting.But nothing in this clause specifies such logic or indicates how the status of the target is known. If the data message to be sent is short, the probe only doubles the opportunity to fail.
- Proposed change
  - Clarify the purpose of the probe and when it is initiated.
- Proposed solutions
  - **AP**

CID 79 (cont.)

- **1. Add paragraph "In probe-mode direct data transfer, an optional probe command is used to detect the receiver status of a neighbor device before transmitting a data when necessary." at line 50, page 14.**

  2. Add text "In case the data size is small, the device may directly send the data to the destination device without probing the receiver status of the neighbor device." after sentence on page 14, line 54.

  (one more modification related: refer to proposed resolution to #78, 3rd point.)

CID 80

- 5.1.6.7.2, P15, L26
  - "If it receives no acknowledgement of the Probe command from the neighbor destination device before expiration of the timer, the destination device is concluded unreachable at this moment."
- Comment
  - What is neighbor destination device?
- Proposed change
  - Clarify and make the device type consistent throughout the section.
- Proposed solutions
  - **AP**
  - **Change "destination device" and "neighbor destination device" to "neighbor device" at line 53 (page 14), line 24 (page 15), line 26 (page 15), line 28 (page 15)**

CID 85

- 5.1.6.7.3 P15, L41 (5.1.6.7.3 Polling-mode direct data transfer)
- Comment
  - This clause is either repeating or redefining functions in the base standard. If the later is intended, it needs to be specified when this new behavior is used instead of the base behavior in such a way that it is compatible with the base standard
- Proposed change
  - Clarify
- Proposed solutions
  - **AP**
  - **Replace text of whole 5.1.6.7.3 (Polling-mode direct data transfer) by "Polling-mode direct data transfer is used by a device to extract data from a neighbor device directly.**
  - **The message sequence of Polling-mode direct data transfer is shown in Figure 22cc. The polling procedure is described in 5.1.6.3 with replacement of a coordinator by a neighbor device."**

CID 87

- 5.1.6.7.3 P15, L44
  - "it sends a data request command to a target neighbor device at the appropriate time and starts a timer with duration of *macACKWaitDuration*."
- Comment
  - Is the target neighbor device similar to destination neighbor device?
- Proposed change
  - Use the same terminology or define the term.
- Proposed solutions
  - **AP**
  - **as resolved in #85**

CID 91, 92

- 5.1.6.7.2 P15, L35 to 21
  - "If the destination device is unreachable, the data frame may remain in the transaction queue until another request from the higher layer is received or *macTransactionPersistenceTime* is reached."
- Comment
  - This paragraph is confusing. Is transaction queue a MAC sub-layer state that is related to a specific MAC source address, MAC destination address, or both of them? Does it mean the MAC sub-layer can buffer multiple packets waiting for transmission? How the MAC sub-layer deals with the Head of Line blocking issue which – if not properly investigated and managed – can significantly degrade device throughput?
- Proposed change
  - This paragraph requires additional technical specification. It introduces a new concept of "transaction queue" at MAC sub-layer. Without specifying what the MAC behavior is at the transmitter (and eventually at receiver) different implementation can implement "wrong" transaction queue management, leading to serious system performance issues.
- Proposed solutions
  - **AP**
  - **Transaction queue is an existing concept of 802.15.4. Please refer to clause 5.1.6.1, 5.1.6.4.3, 5.1.6.6, 6.3.4, and 6.3.5 of 802.15.4-2011.**
  - **No additional specification needed.**

CID 101

- 5.1.6.7.5, P17, L22
  - “A device multicast a data frame to a subset of its neighbor devices upon receiving higher layer MCPSDATA. Request primitive with a multicast address.”
- Comment
  - The first sentence does not read that well, need to insert either "shall" or "may"
- Proposed change
  - "A device ***may*** multicast a data frame to a subset…"
- Proposed solutions
  - **AP**
  - **Change text to "A device *multicasts* a data frame …"**

CID 102

- 5.1.6.7.5, P17, L22
  - "A device multicast a data frame to a subset of its neighbor devices upon receiving higher layer MCPSDATA. Request primitive with a multicast address."
- Comment
  - The use of mulitcast addressing in not defined in the 802.15.4-2011 released standard or subsequent amendments.
- Proposed change
  - Add additional information about the requirements for multicast addressing and how a device subscribes to a multicast group. What addressing modes are required? What are the acknowledgement options? How does the device know about possible multicast groups? If parts of this behavior are outside of 802.15.4, then state which parts are outside of 15.4. For those parts that are part of 15.4, give the associated details.
- Proposed solutions
  - **Reject**
  - **To realize multicast addressing and operation management on MAC layer, it requires a multicast-host device to manage a number of multicast group addresses and a group of device addresses for each multicast group on MAC layer. This will make a device too complicated. A simpler solution is higher layer to manage multicast addressing and operations.**
  - **Acknowledgement for a multicast data frame is not preferred in order to avoid collisions. Please refer to #108, too.**

CID 107

- 17 5.1.6.7.5, P17, L28
  - "Note: The form of an EUI-64 Multicast address is given in Registration Authority Committee (RAC)."
- Comment
  - It states, "The form of an EUI-64 Multicast address is given in Registration Authority Committee (RAC)." This is not normative text.
- Proposed change
  - State that "Multicast addresses shall be in the form of an EUI-64 Multicast address as given in Registration Authority Committee (RAC)." It would be helpful to have the table of multicast addresses included in the document, maybe in an Annex.
- Proposed solutions
  - **AP**
  - **Delete text "Note: The form of an EUI-64 Multicast address is given in the Registration Authority Committee (RAC)." as forming a multicast address is managed by the higher layer.**

CID 108

- 5.1.6.7.5, P17, L40
- Comment
  - In Figure 22ce, it shows that Acknowledgement to a Multicast Transfer is an option. However, this leads to collision problems unless the access mode for the acknowledgement contains collision avoidance.
- Proposed change
  - Either:
    1) Prohibit Acknowledgements to Multicast tranfers
    or
    2) Define a collision avoidance mechanism for the acknowledgement frames.
- Proposed solutions
  - **AP**
  - **Edit Figure 22ce by deleting "Acknowledgement (if requested)" and the two dash lines.**
  - **Add text "Acknowledgement is not required for a multicast data frame." at the end of the first paragraph of 5.1.6.7.5.**

CID 109, 110

- 5.1.6.7.4, P17, Figure 22cd

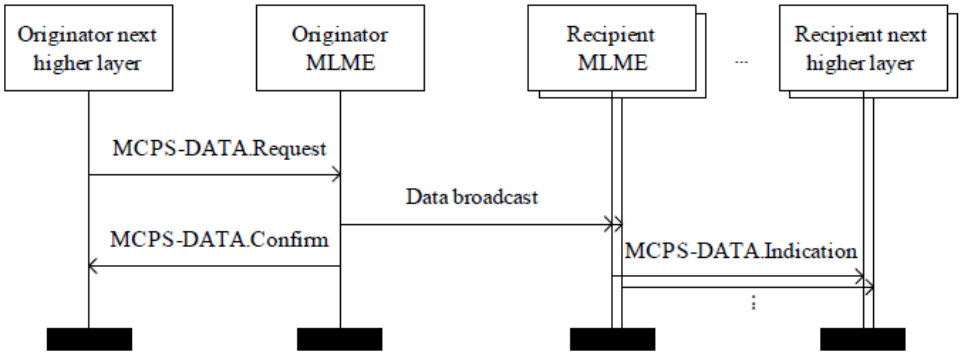

Figure 22cd—Message sequence chart for broadcast-mode direct data transfer

- Comment
  - Broadcast-mode direct data transfer should allow data sent in broadcast to be acknowledged, in order to increase system performance.
- Proposed change
  - Allows a device to send MAC layer data broadcast and request ACK.
- Proposed solutions
  - **Reject**
  - **Acknowledgements to a broadcast data frame may collide. Refer to #108, too.**

CID 111, 116

- 5.1.6.7.5, P17 (5.1.6.7.5 Multicast-mode direct data transfer)
- Comment
  - A MAC layer multicast mode direct data transfer sounds interesting; however, it is not clear what is the real benefit of a MAC layer multicast over a MAC layer broadcast, in radio networks, other than maybe some faster MAC traffic filtering based on multicast address.
- Proposed change
  - Provide some explanation on the benefit of using MAC multicast over MAC broadcast.
- Proposed solutions
  - **Reject**
  - **It is not necessary to explain benefit of multicast over broadcast in a standard.**

CID 112, 117

- 5.1.6.7.5, P17 (5.1.6.7.5 Multicast-mode direct data transfer)
- Comment
  - There is also no specification of the mechanism defined for assigning and managing such MAC layer multicast addresses. How MAC multicast address collision is avoided? How many such MAC layer multicast groups can be used?
- Proposed change
  - Provide specification of mechanism as indicated in the comment.
- Proposed solutions
  - **Out of scope**
  - **Assigning and managing MAC layer multicast addresses are functions of higher layers. Refer to resolution to #102**

CID 113, 118

- 5.1.6.7.5, P17 (5.1.6.7.5 Multicast-mode direct data transfer)
- Comment
  - What is the receiver & transmitter behavior when receiving/transmitting a MAC frame in MAC multicast?
- Proposed change
  - Provide description as indicated in the comment.
- Proposed solutions
  - **Reject**
  - **Receiver and transmitter behaviors in multicast are as usual. It is uncessary to describe them specially.**

CID 114, 119

- 5.1.6.7.5, P17 (5.1.6.7.5 Multicast-mode direct data transfer)
- Comment
  - Where the primitives used by upper layer applications to ask for such multicast service at MAC sub-layer are defined?
- Proposed change
  - Provide specification as indicated in the comment.
- Proposed solutions
  - **Reject**
  - **A multicast service can be identified by address of the a multicast data frame. For example, An IPv6 address is easy to classify as multicast because it always begins with "FF". No special primitive is required.**

CID 115, 120

- 5.1.6.7.5, P17 (5.1.6.7.5 Multicast-mode direct data transfer)
- Comment
  - How the upper layer (IP layer) will be mapping an IPv6 multicast address into MAC multicast address: Same way it does for the mapping between IP multicast and MAC broadcast?
- Proposed change
  - Provide details of maping upper layer multicast into MAC multicast versus mapping upper layer multicast into MAC broadcast.
- Proposed solutions
  - **Out of scope**
  - **Address mapping between upper layer and MAC layer is not in scope of this standard.**

CID 220

- 6.2.14.1, P50, L16
  - “The primitive parameters are defined in Table 34.”
- Comment
  - I think the primitive parameters are defined in Table 38
- Proposed change
  - Clarification required
- Proposed solutions
  - **Accept**
  - **Change "Table 34" to "Table 38".**