Date: 1/18/2023

Title: Changes to Draft 0.2/0.3 of P802.16t document

Purpose: This document has a list of changes, which would be required to the P802.16t specification draft.

1. In Section 6.3.37.1.1 “Minimizing MAC and PHY layer overhead”,
   1. in the first paragraph, references to previous specification versions should be added with regards to 1.25 MHz and 100 kHz bandwidths to reduce confusion to the reader who may not be aware the of the origins of these channel bandwidths.

Resolution – skip this – it is implicit in the final document.

* 1. in the first paragraph and all throughout the document, kilohertz should be abbreviated with a lower case ‘k’, in other words “kHz”.

Accept.

* 1. in the second paragraph, suggest changing “are not transmitted” to “do not have to be transmitted” in “The bandwidth allocation messages are not transmitted in every frame.” in case the capability remains to send bandwidth allocation messages in every frame will not be specifically disallowed.
     1. Alternate resolution: “Alloc-MSG are not required to be transmitted every frame, but may be transmitted every frame”

Resolution – Change. Below is the corrected version.

DL and UL bandwidth allocation messages are a significant contributor to overhead when reducing the channel bandwidth below 100kHz. For the **XXX**, this overhead is reduced maintaining bandwidth allocation messages only for bursty applications. The bandwidth allocation messages do not have to be transmitted every frame. In addition, the introduction of new less dynamic scheduling modes, e.g., Semi-Persistent Service (SPS) scheduling mode further reduces overhead.

1. In Section 6.3.37.1.2 “Support of low latency applications”,
   1. in the third paragraph, instead of saying “Regular MAP messages” should refer to the specific messages in the specification (DL-MAP? UL-MAP?) to reduce confusion

Resolution – Change. Below is the corrected statement.

DL-MAP and UL-MAP messages are not used.

1. In Section 6.3.37.1.3 “Allocation messages reduction”,
   1. In the first paragraph, instead of saying “current MAP messages” should refer to the specific messages in the specification (DL-MAP? UL-MAP?). Using words “current”, “past”, etc. should be avoided since these references become outdated over time.

Resolution - Change. Below is the corrected version.

Reduction of allocation message overhead for low-rate regular traffic applications and for the use of bulk allocations requires more flexible bandwidth allocation messages compared to DL-MAP and UL-MAP messages.

1. In Section 6.3.37.1.4 “Support of BSC by the BS MAC layer”,
   1. It should be explained that BSC will be used only for radio resource control and not for data backhaul (or other network functions) to provide proper context. (In typical cellular context BSC provides both data and control planes to the base stations.)
      1. Principle – change name of BSC to “Air Interface Resource Manager” AIRM
      2. Note – replace “MAC Layer” with “MAC sub-layer”

Accept. Resolution – Change “BSC” to “AIRM” in the entire document and the definition talks only about resource coordination for BSs, it does not mention any other functionality.

**Air Interface Resource Manager (AIRM):** a software system that coordinates the use of Air Interface Resources for a set of Base Stations and associated Remote Stations within a defined Control Area for the purpose of avoiding radio frequency interference.

1. In Section 6.3.37.2.1 “Frame Structure”,
   1. In the second paragraph, instead of “per the channel bandwidth” should refer to “NB subchannel bandwidth” or “subcarrier bandwidth”.
      1. Principle – use “NB subchannel bandwidth”
   2. The “Table 1” reference should be corrected to refer to Table 6.3.37.2 and the table should have a proper title.

Accept. Resolution – change to “NB subchannel bandwidth”

1. In Section 6.3.37.3.1 “Super Frame Structure”,
   1. The introduction of Super Frames should include an explanation or motivation why Super Frames are being used in the standard.
      1. Principle – Menashe will provide some text for explanation.

Resolution – The explanation is provided in section 6.3.37.3.3

6.3.37.3.3 Frame duration and Super-frame duration

The longer the frame, the longer the latency. Support of low frame duration is needed to support low latency requirement of high priority applications. The frame duration for such an application will be configured such that a complete PDU can be encapsulated in one frame. The objectives of the super-frame are:

* Provide an additional dimension of separation between sectors for the scheduler to avoid self interference
* Extend the allocation window many frames into the future.

The duration of a super-frame will be greater than the maximum interval among all UGS/SPS allocations.

1. In Section 6.3.37.3.4.2 “Between BSC and BSs in the control area” and all throughout the document,
   1. Instead of “GPS”, should consider using the acronym “GNSS” (Global Navigation Satellite System) instead. GNSS is becoming a more general term, which better covers the cases where other than GPS satellite constellations (Galileo, GLONASS, etc.) are being used.

Accept.

1. In Section 6.3.37.4.1 “Unsolicited Grant Service (UGS)”,
   1. In the third paragraph, the statement “The validity is infinite” would be good to be accompanied with possible exception cases. Such exceptions might be for instance a remote radio disconnect or handover from the base, or another ALLOC-MSG overriding or cancelling the previous allocation.
      1. Principle – rename UGS to NB-UGS. Clarify wording that it is a static allocation that can be re-allocated or reclaimed in exceptional circumstances. Remove “infinite” (copy from related section in base standard for UGS) Action Menashe.

Accept. Resolution – Change the description. Below is the corrected statement.

UGS service is started after service flow creation and the allocation is based on QOS parameters of the service flow.

The allocations are valid throughout the session of the remote. Allocations are terminated when the remote disconnects or handover from the BS.

1. In Section 6.3.37.4.2 “Semi Persistent Service (SPS)”,
   1. In the first paragraph, the statement “The service has a validity period which can be finite” should be replaced with a more specific sentence.
      1. Principle – Assign to Menashe to develop new wording

Resolution - Remove validity in case of SPS as its determined dynamically. Below is the modified version.

6.3.37.4.2 Semi Persistent Service (SPS)

SPS is a variation of UGS. It is dynamically activated and terminated. SPS is designed to serve a specific

application with known characteristics. The respective SPS parameters are designed to accommodate the

periodicity and packet size of the application.

The following parameters are included in an SPS allocation:

• The interval between successive allocations.

• The size of the individual allocation within each interval.

• The activation and termination criteria.

SPS can be established and terminated dynamically during operation. SPS service flow parameters are

defined in the SF configuration file. The activation condition is the detection of an SDU with one or more

classifiers matching the condition. The termination of the SPS service flow is the absence of the SDU

matching the condition for a certain period. SPS service flows may be established in both DL and UL.

1. In Section 6.3.37.4.4 “Instantaneous Allocation Service”,
   1. The sentence “The scheduler will consider on demand bandwidth request” seems disconnected and could be either removed or combined with the previous sentence.
      1. Principle – remove the sentence.

Accept.

1. In Section 6.3.37.4.5 “Delivery of Allocation Message”,
   1. “In case of uplink allocations, BS can start the allocation after sending the allocation message and monitor the status.”
      1. Should split the sentence to remove ambiguity.
      2. “monitor the status” should be changed to “monitor the allocation usage”
   2. “BS shall schedule allocation in future frame offset considering the waiting period for ACK message and can start allocation only after receiving ACK message from the remote.” The highlighted part seems redundant and could be removed for clarity.
   3. “BS can resend the allocation message, In uplink, …” “In uplink/downlink, …” should be changed to “for uplink/downlink allocations”
      1. Principle – Menashe to provide modified text.

Resolution - Change. Below is the corrected section.

6.3.37.4.5 Delivery of Allocation Message

In case of UGS and SPS allocations where the allocations are repeated, the BS must ensure the allocation message is delivered to the remote.

The following measures shall be taken to guarantee the delivery of an allocation message.

* The allocation message shall be transmitted in Robust FEC code.
* Remote shall acknowledge the reception of allocation message by sending ACK message (ALLOCCTRL-MSG, see Table 6) with control code set to Acknowledge.
* In case of uplink allocations, BS shall start the allocation after sending the allocation message. BS shall monitor the allocation usage. The remote shall start using the allocation after receiving allocation message.
* In case of downlink allocations, BS shall start allocation only after receiving ACK message from the remote.
* BS shall resend the allocation message for uplink/downlink allocations if BS does not receive ACK within the timeout period. In case of uplink allocations, a transmission in the allocation shall be considered as alternative to ACK by the BS.

1. In Section 6.3.37.4.6 “BS Scheduler”,
   1. “The scheduler maintains information of scheduled allocations which are valid.” Is there a possibility for non-valid allocations to be considered? The highlighted part is likely confusing to the reader and should be removed.
      1. Principle – Menashe to provide clarified text explaining what Valid means.

Resolution – remove “which are valid” from the statement as all are valid allocations. Below is the changed statement.

The scheduler maintains information of scheduled allocations.

* 1. “Allocation messages are sent over each self-sufficient subchannel group” Since all subchannel groups are self-sufficient, should remove the highlighted part and explain self-sufficiency in a separate sentence if needed.

Accept. Resolution – remove “self-sufficient” from the statement. Self-sufficiency is defined in section 8.6.3.

* 1. In the third paragraph,
     1. “In case” should be changed to “In case of”.
     2. Consider changing “determines the resource allocated” to “determines available resources”.
     3. Consider changing “In this mode, the BS shall have mixed operations, scheduling the available slots as primary and requesting for bandwidth as secondary” to “In this mode, the BS shall have mixed operations, scheduling the already granted slots as primary and requesting more resources from the BSC if congested as secondary”
        1. Principle – some part of text to be removed – Menashe will propose new text.

Accept. Resolution – Change. Below is the modified version.

In case of secondary scheduler MAC mode, the BS scheduler determines the available resources on any subchannel group based on the downlink and uplink allocations granted by the BSC for that subchannel group. In this mode, the BS shall have mixed operations, scheduling the already granted slots as primary and requesting more resources from the BSC if congested as secondary.

In case of standalone MAC mode, the BS scheduler calculates the resource available on any subchannel group based on the number of subchannels in the group.

1. In Section 6.3.37.5.1 “Allocation Message (ALLOC-MSG) format”,
   1. “The allocation information is of variable length, and it can be transmitted on the least common downlink FEC code of the remotes being allocated in the message.” In case other remotes, which do not have allocations, need to be able hear any “common to all” allocations, such as where to do ranging, this approach could cause issues and “Downlink Robust FEC” should be used instead.
      1. Principle fix text for normative language – change to Shall.

Accept. Resolution – In case of uplink ranging allocations, allocation information will be transmitted on downlink Robust FEC, but if the allocation information carries only data allocations then it need not be transmitted on Downlink Robust FEC. Below is the modified version.

The allocation information is of variable length, and it can be transmitted on the downlink robust FEC code or on the least common downlink FEC code of the remotes being allocated in the message. If the allocation information has uplink ranging allocation then it shall be transmitted on the downlink robust FEC code (to be decoded by all remotes) and if the allocation information had uplink/downlink data allocations then its shall be transmitted on the least common downlink FEC code of the remotes being allocated in the message.(to be decoded by concerned remotes).

1. In Section 6.3.37.6 “Simplified Nework Entry”
   1. Section hearder has a typo.
   2. “…the network entry procedure is simplified with minimum message exchanges…” Consider changing “minimum” to “less”.
      1. Principle – change to “fewer”

Accept. Resolution – Changed. Below is the modified version.

**6.3.37.6 Simplified Network Entry**

The 802.16-2017 network entry procedure involves multiple message exchanges between BS and remote after initial ranging phase. In 802.16t implementation the network entry procedure is simplified with fewer message exchanges between BS and MS.

1. In Section 8.6.3.2 “NB Subscriber Stations”,
   1. Change references “subchannel” to “subchannel group”

Accept.

1. In Section 8.6.5.1 “TDD Frame Structure”,
   1. In Figure 5 and 6, the meaning of the index numbers needs to be clarified (if not meant to refer to PLMR channels). One way to do this is to add a (second) label.
      1. Principle – add text to labels indicating they are subchannel groups.
   2. In the last paragraph figure explanations, the index numbers are referred to as “subchannels”. This should be changed to “subchannel groups” if that is what index numbers refer to. In other words, the meaning of the index numbers in the figures and in the explanations would need to match. Also, the numbers explained do not fully match what’s in the figures.
      1. Principle - Menashe will resolve offline.

Resolution:

Figures are corrected and updated with Subchannel groups as label. Figures are shared over email.

Modify the lines as below:

~~165 Figure 5 shows an example of a frame containing Preamble, ALLOC-MSGs in every subchannel within 166 the frame. Figure 6 shows subchannels 2, 4, 5, 6, and 7 with no ALLOC-MSG, indicating the allocation 167 is informed in previous frame whereas remaining subchannels are having the ALLOC-MSGs in the 168 shown frames. In addition, subchannels 2, 4 and 6 do not have a preamble in this frame.~~

Figure 5 shows an example of a frame containing Preamble, ALLOC-MSGs in every subchannel group within the frame. Figure 6 shows an example of a frame where the preamble is not present and subchannel groups 2, 4, 5, 6, and 7 do not have ALLOC-MSG, indicating the allocation is informed in the previous frames.

1. In Section 8.6.5.3 “TTG and RTG configuration”,
   1. The needing to be supported values or ranges of TTG and RTG would need to be specified.
      1. Principle – Menashe to provide cross reference to place where explained.

References of TTG and RTG can be found in base standard. E.g. 8.1.3.2.1/2 and many other places.

1. In Section 8.6.6.2 “Modulation and FEC Rates”,
   1. In bullet (b), change “is” to “are

Accept.

1. In Section 8.6.7.1.5 “Repetition”,
   1. This section needs more detail on how repetition will be used and for instance answer the questions:
      1. Does repetition rate need to be communicated between base and remote?
      2. Will repetition become part of MCS and the link adaptation scheme?
      3. Principle – Menashe wil update
2. In Section 8.6.7.5 “TX signal filtering”,
   1. “Any of the filter design techniques can be used to obtain a filter that satisfies the above.” An additional sentence needs to be added for the filter needing to be a phase linear FIR filter.
   2. “The response of the filter in the frequency domain for a single subchannel where the center subchannel is occupied is given below” Should instead use a reference to Figure 14.
   3. Figure 14 has a wrong plot and must be corrected.
      1. For entire filtering section: Principle – Menashe to fix up.