### IEEE P802.11Wireless LANs

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| 11ba D2.1 MAC Comment Resolution for WUR Duty Cycle Part I |
| Date: 2019-04-17 |
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Abstract

This submission proposes resolutions for comments of TGba Draft D2.1 with the following CIDs:

~~2037,~~ 2045, 2046, 2123, 2356, 2213, 2214, 2263, 2417, 2433, 2434, 2435, 2450, 2470, 2606, 2607, 2608, 2729

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Revision based on the offline discussion. Defer 2037.

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGba D2.1 Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGba D2.1 Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGba Editor: Editing instructions preceded by “TGba Editor” are instructions to the TGba editor to modify existing material in the TGba draft. As a result of adopting the changes, the TGba editor will execute the instructions rather than copy them to the TGba Draft.***

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| **CID** | **Commenter** | **P.L** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| ~~2037~~ | ~~Alfred Asterjadhi~~ | ~~52.57~~ | ~~9.4.2.292~~ | ~~The WUR Mode element does not have an identifier of a particular session. As such a STA and an AP can only negotiate one periodicity. This seems to be very limiting. Please add an identifier to allow multiple periodicities. If complexity is a concern then specify that certain STAs cannot support more than one session.~~ | ~~As in comment.~~ | ~~Rejected –~~ ~~Multiple negotiation sessions create complexity for the WUR negotiation, which is supposed to be a simple operation.~~ ~~For example, there will be questions on whether a WUR AP can indicate different IDs or group IDs or other paramters in different negotiation sessions.~~ ~~There will be many additional rules on just expanding the negotiations to multiple sessions, which is not necessary.~~  |
| 2045 | Alfred Asterjadhi | 68.1 | 30.6 | This paragraph is unclear. Please re-write so that it becomes clear what the intended purpose of it is. | As in comment. | Revised – Agree in principle with the commenter.We rewrite the paragraph to put the statement up front. TGba editor to make the changes shown in 11-19/0590r1 under all headings that include CID 2045 |
| 2046 | Alfred Asterjadhi | 68.30 | 30.6 | This paragraph and the next one seem to have conflicting/duplicate contexts. Remove one of the two. | As in comment. | Revised – Agree in principle with the commenter. We remove the second paragraph.TGba editor to make the changes shown in 11-19/0590r1 under all headings that include CID 2046 |
| 2123 | Hanseul Hong | 46.48 | 9.4.2.292 | The duty cycle period is only included in the WUR mode element sent by WUR non-AP STA. For broadcast WUR Wake-up frame transmission and WUR Wake-up frame transmission with WUR Group ID, it will be better for AP to indicate the preferred duty cycle period. Especially, for denial case with infeasible duty cycle period, WUR non-AP STA will perform WUR negotiation process multiple times if the duty cycle period is not included in the WUR mode element sent by WUR AP. | Include the duty cycle period subfield in the WUR mode element sent by WUR AP, or add the proposed duty cycle period for denial case with long duty cycle period. | Rejected – WUR AP can already regulate the basic unit of the WUR duty cycle period. Further, there are examples in the baseline design where a denial reason includes the value of a parameter too large without indicating the actual preferred parameter. For example, we have the following reason code for denying association if listen interval is too large. However, we do not have indication for AP to indicate the prefer listen interval. *DENIED\_LISTEN\_INTERVAL\_TOO**\_LARGE**Association denied because the listen interval is too large.* |
| 2356 | MARC EMMELMANN | 30.7 | 9.4.2.273 | The duty cycle period is only included in the WUR mode element sent by STA. For duty cycle scheduling and transmission of broadcast WUR Wake-up frame, AP should be able to indicate the preferred duty cycle period | Picking up on comments made in the previous letter ballot on D1.0, the TG did not properbly address the issue raised in the comment, nor does the TG provide an indication that the text commented on has been deleted and hence the comment does not apply. (Note, page and line and sublause number refer to D1.0). In fact, as stated in the TGba minutes (11-19/226r1), the intend of the task group was to "Move to resolve CIDs that have no approved resolution as rejected with a reason read "TGba is unable to reach consensus on a resolution" in the interest of releasing draft 2.0". Also, the statement ""TGba is unable to reach consensus on a resolution" was added to the motion text there was one person speaking against the motion." was only added to the motion after objection to the original motion trying to reject comments in bulk with the reason of releasing a new LB.The TG is asked to give the original comment due consideration and debade the proposed comment resolution as included in 11-18/1794r10. The referenced document includes an actionable comment resolution. | Rejected – WUR AP can already regulate the basic unit of the WUR duty cycle period. Further, there are examples in the baseline design where a denial reason includes the value of a parameter too large without indicating the actual preferred parameter. For example, we have the following reason code for denying association if listen interval is too large. However, we do not have indication for AP to indicate the prefer listen interval. *DENIED\_LISTEN\_INTERVAL\_TOO**\_LARGE**Association denied because the listen interval is too large.* |
| 2213 | Joseph Levy | 67.26 | 30.6 | The explanation of what the WUR duty cycle does not belong in clause 30, it belongs in clause 4. | Move the first paragraph of 30.6 to clause 4 or delete it. | Revised –We note that the first paragraph describes the overview of WUR duty cycle operation. This is similar to the other features where a general overview is provided.For example, for TWT, we have the following overview description, which is not in clause 4.*Target wake times (TWTs) allow STAs to manage activity in the BSS by scheduling STAs to operate at**different times in order to minimize contention and to reduce the required amount of time that a STA**utilizing a power management mode needs to be awake.*However, agree that we may need some general definition, and we provide the definition of WUR duty cycle schedule and WUR duty cycle period in clause 3.TGba editor to make the changes shown in 11-19/0590r1 under all headings that include CID 2213 |
| 2214 | Joseph Levy | 68.1 | 30.6 | After the specifying that the WUR duty cycle parameters for operation are defined in the WUR Mode Setup in 30.7.2 this clause then seems to go on to explain how the parameters are defined. This is either redundant or the reference to clause 30.7.2 is unnecessary. | As in comment. Remove unnecessary specification or references. | Rejected –The commenter does not point out specifically the location with unnecessary specficiation and references.The descriptions in 30.6 are necessary to provide the understanding of WUR duty operation and required setting.  |
| 2263 | Lei Wang | 68.44 | 30.6 | The paragraph in line 44 on page 68 is very confusing about the relationships among On Duration, Doze State, Awake state, duty cycle, etc. | Suggest chaning to the following text:If a WUR non-AP STA is in WUR mode and the main radio of the WUR non-AP STA is in the doze state, the WUR of the WUR non-AP STA shall be ON within the on duration of a WUR duty cycle period. | Rejected –In Jan IEEE meeting, the group agrees to treat WUR as a capability without mentioning main radio or WUR receiver.We note that awake state and doze state is defined in the baseline for the capability to receive non-WUR PPDUs. In 11ba, we defined WUR awake and WUR doze for the capability to receive WUR PPDU. |
| 2417 | Michael Montemurro | 49.16 | 9.4.2.292 | In table 9-321f the expression of the field values are ambiguous. | Change "The unit of the field is 4 us" to "The OnDuration subfield value is encoded in units of 4 ms".Change"The unit of the field is indicated..." to "The Duty Cycle Period subfield is encoded based on the value of the Duty Cycle Period Units field in the most recently received WUR Operation element from the associated WUR AP" | Rejected – We note that similar expression has been used across the spec. See examples below.*The unit of the Neighbor Beacon Interval subfield is TU.**The unit of the TSF Timer Accuracy field is ppm**The unit of the offset value is microseconds.* |
| 2433 | Ming Gan | 67.27 | 30.6 | What is WUR non-AP STA in the "after the WUR non-AP STA enters the doze state" . Is it WURx or PCR? | Clarify it. | Rejected – In Jan IEEE meeting, the group agrees to treat WUR as a capability without mentioning PCR or WUR receiver.We note that the awake state and the doze state are defined in the baseline for the capability to receive non-WUR PPDUs. Hence, the doze state here refers to the capability to receive non-WUR PPDUs. In 11ba, we defined the WUR awake and the WUR doze for the capability to receive WUR PPDU. |
| 2434 | Ming Gan | 67.32 | 30.6 | Why does WUR AP need if dot11WUROptionImplemented. Note that it already said that is WUR. | As in comment | Revised – Agree in principle with the commenter.We remove “if dot11WUROptionImplemented is true.”TGba editor to make the changes shown in 11-19/0590r1 under all headings that include CID 2434 |
| 2435 | Ming Gan | 67.35 | 30.6 | Remove this paragraph, It overlaps with preceding paragraph | As in comment | Rejected – The previous paragraph is “*A WUR AP shall support WUR duty cycle operation if dot11WUROptionImplemented is true.*”, and it does not overlap with the cited paragraph “*A WUR non-AP STA establishes WUR duty cycle operation with the WUR AP to which it is associated through WUR Mode Setup as described in 30.7.2 (WUR Mode Setup).*”. |
| 2450 | Minyoung Park | 46.36 | 9.4.2.292 | Since presence of the field "WUR Duty Cycle Start Time" depends on the "WUR Duty Cycle Start Time Present" field in the WUR Parameters Control field, the size of the WUR Duty Cycle Start Time field should be "0 or 64". | Change "64" to "0 or 64" | Accepted - |
| 2470 | Minyoung Park | 68.41 | 30.6 | The WUR duty cycle schedule is used in the later subclauses many times and would be good to have the definition also in the Clause 3. | Add the definition of the WUR duty cycle schedule in Clause 3. | Revised – Agree in principle with the commenter.TGba editor to make the changes shown in 11-19/0590r1 under all headings that include CID 2470 |
| 2606 | Rojan Chitrakar | 68.1 | 30.6 | Is the intention of this paragraph to specify the condition when the WUR AP includes the WUR Duty Cycle Start Time field in the WUR Mode element? If so, the paragraph could be written in a simpler way; at present the intention of the paragraph is difficult to understand. | Rephrase the sentence to clarify the WUR AP's normative behaviour. | Revised – Agree in principle with the commenter.We rewrite the paragraph to put the statement up front. TGba editor to make the changes shown in 11-19/0590r1 under all headings that include CID 2606 |
| 2607 | Rojan Chitrakar | 68.1 | 30.6 | Does this also mean that for "Always On" STAs, the WUR Duty Cycle Start Time field is omitted in the WUR Mode element? | WUR AP's behaviour when the on duration is equal to the duty cycle period should also be clarified. | Revised – Agree in principle with the commenter. We add a sentence to describe the behaviour.TGba editor to make the changes shown in 11-19/0590r1 under all headings that include CID 2607 |
| 2608 | Rojan Chitrakar | 68.21 | 30.6 | What does " .... and the duty cycle period." mean here? Is the intention to say that non-AP STA is required to calculate the start point based on the content of the WUR Duty Cycle Start Time subfield and the duty cycle period? If so, it should be phrased more clearly. | Rephrase the sentence to clarify the non-AP STA's action if any. | Revised – Agree in principle with the commenter. We simply remove “and the duty cycle period.”TGba editor to make the changes shown in 11-19/0590r1 under all headings that include CID 2608 |
| 2729 | Xiaofei Wang | 48.26 | 9.4.2.292 | Are there multiple WUR duty cycles for a WUR STA? If not, then "one WUR duty cycle" should be changed to "the WUR duty cycle". | as in comment. | Revised – Agree in principle with the commenter. We note that there is only one WUR duty cycle, but there coule be multiple on duration, and each on duration is called a WUR duty cycle schedule. We revise the sentence to say “a” rather than “one.”TGba editor to make the changes shown in 11-19/0590r1 under all headings that include CID 2729 |

**Discussion:** *None.*

**Propose:** Revised for CID 2046, 2606, 2607, 2434, 2608, 2045, 2470, 2450, 2729, 2213 per discussion and editing instructions in 11-19/0590r1.

***TGba editor: Change 30.6 WUR duty cycle operation as follows:***

* WUR duty cycle operation

WUR duty cycle operation reduces the required amount of time that a WUR non-AP STA utilizing WUR mode needs to be in the WUR awake state after the WUR non-AP STA enters the doze state (see 30.7 (WUR power management procedure)) and allows a WUR AP to manage WUR activity in the BSS by scheduling a WUR non-AP STA to receive WUR frames at different times.

A WUR AP shall support WUR duty cycle operation.(#2434)

A WUR non-AP STA establishes WUR duty cycle operation with the WUR AP to which it is associated through WUR Mode Setup as described in 30.7.2 (WUR mode setup).

WUR duty cycle operation is determined by the following parameters: start point, on duration, and duty cycle period (see Figure 30-1 (WUR Duty Cycle)).

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|  |
| * WUR Duty Cycle
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The start point indicates the start time of an on duration. For any on duration, the start time of the next on duration is equal to the start time of the on duration plus the duty cycle period.

A WUR AP indicates the minimum wake-up duration in the Minimum Wake-up Duration subfield of the WUR Operation element and the duty cycle period unit in the Duty Cycle Period Units subfield of the WUR Operation element.

In the response frame sent by the WUR AP during a WUR Mode Setup (see 30.7.2 (WUR mode setup)), the WUR Duty Cycle Start Time present subfield of the WUR Parameters Control field in the WUR Mode element within the response frame shall be set to 1 if the WUR Mode Response Status field of the carrying WUR Mode element within a response frame is set to “Accept,” and the on duration indicated in the On Duration subfield of the WUR Parameters field in the WUR Mode element within the request frame during the WUR Mode Setup is less than the duty cycle period indicated in the Duty Cycle Period subfield of the WUR Parameters field in the WUR Mode element within the request frame. Otherwise, the WUR Duty Cycle Start Time present subfield of the WUR Parameters Control field in the WUR Mode element within the response frame shall be set to 0.. (#2045, #2606, #2607)

After a WUR non-AP STA establishes WUR duty cycle operation with a WUR AP through WUR mode setup as described in 30.7.2 (WUR mode setup):

* the duty cycle period is indicated in the Duty Cycle Period subfield of the WUR Parameters field in the WUR Mode element transmitted by the WUR non-AP STA.
* the on duration is indicated in the On Duration subfield of the WUR Parameters field in the WUR Mode element transmitted by the WUR non-AP STA.
* the start point is indicated in the WUR Duty Cycle Start Time subfield of the WUR Parameters field in the WUR Mode element transmitted by the WUR AP.(#2608)

A WUR non-AP STA shall set the On Duration subfield of the WUR Parameters field in the WUR Mode element to indicate a duration that is larger than or equal to the duration indicated by the Minimum Wake-up Duration subfield in the most recently received WUR Operation element from the associated WUR AP.

A WUR non-AP STA shall set the On Duration subfield of the WUR Parameters field in a WUR Mode element to indicate a duration that is smaller than or equal to the duty cycle period indicated in the Duty Cycle Period subfield of the WUR parameters field in the WUR Mode element.

(#2046)The on duration in a duty cycle period of an established WUR duty cycle operation is called a WUR duty cycle schedule.

If a WUR non-AP STA is in WUR mode, and the WUR non-AP STA is in the doze state, the WUR non-AP STA shall be in the WUR awake state within the on duration of a WUR duty cycle period.

***TGba editor: Change 3.2 Definitions specific to IEEE Std 802.11 as follows:***

* Definitions, acronyms, and abbreviations
* Definitions specific to IEEE Std 802.11

Insert the following definitions maintaining alphabetical order:

**multicarrier on-off keying (MC-OOK) symbol:** A MC-OOK symbol can be either an On symbol where the multicarrier signal is present or an Off symbol where the multicarrier signal is not present.

**wake-up radio (WUR) access point (AP):** An access point (AP)that is a non-high-throughput (non-HT), high-throughput (HT), very high throughput (VHT), or high efficiency (HE) AP that is capable of transmitting a WUR physical layer (PHY) protocol data unit (PPDU) and supports the WUR operation.

**wake-up radio (WUR) channel:** A channel in which a WUR access point (AP) transmits WUR frames and a WUR non-AP station (STA) listens.

**wake-up radio (WUR) discovery channel:** The channel used by a WUR access point (AP) to transmit WUR Discovery frames.(#2701)

**wake-up radio (WUR) duty cycle period:** The interval between the starts of two successive WUR duty cycle schedules.(#2470, #2213)

**wake-up radio (WUR) duty cycle schedule:** The on duration in a duty cycle period of an established WUR duty cycle operation during which one or more WUR frames can be transmitted to the WUR non-AP STA that negotiates the WUR duty cycle operation.(#2470, #2213)

(…existing texts ….)

***TGba editor: Change 39.4.2.292 WUR Mode element as follows:***

* WUR Mode element

(…existing texts ….)

The WUR Parameters Control field indicates the configuration of the following WUR Parameters field. The format of the WUR Parameters Control field when the Action Type field is set to “Enter WUR Mode Response” or “Enter WUR Mode Suspend Response” and the WUR Mode Response Status field is set to “Accept” or when sent by a WUR non-AP STA is shown in Figure 9-772g (WUR Parameters Control field format).

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| --- | --- | --- | --- | --- |
|  | B0 | B1     | B2 | B3                         B7 |
|  | WUR Duty Cycle Start Time Present | WUR Group ID List Present | Recommended WUR Parameters Present | Reserved |
| Bits: | 1 | 1 | 1 | 5 |
| * WUR Parameters Control field format
 |

 Otherwise, the filed is reserved.(#2696, #2697, #2752)

(#2696, #2697, #2752)

The WUR Duty Cycle Start Time Present subfield is set to 1 if the WUR Duty Cycle Start Time subfield is present in the following WUR Parameters field and is set to 0 otherwise.

The WUR Group ID List Present subfield is set to 1 if the WUR Group ID List subfield is present in the following WUR Parameters field and is set to 0 otherwise.

The Recommended WUR Parameters Present subfield is set to 1 if the Recommended WUR Parameters subfield is present in the following WUR Parameters field and is set to 0 otherwise.(#2696, #2697, #2752)

The subfields of the WUR Parameters field sent from a WUR AP when the Action Type field is set to “Enter WUR Mode Response” or “Enter WUR Mode Suspend Response” and the WUR Mode Response Status field is set to “Accept” are defined in 9-772h (WUR Parameters field format from WUR AP) and Table 9-321d (Subfields of WUR Parameters field from WUR AP). Otherwise, the WUR Parameters field sent from a WUR AP is reserved.

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| --- | --- | --- | --- | --- | --- |
|  | B0     B11 | B12           B14 | B15 | B16                        B79 |  |
|  | WUR ID | WUR Channel Offset | Reserved | WUR Duty Cycle Start Time  | WUR Group ID List |
| Bit: | 12 | 3 | 1 | 0 or 64(#2450) | Variable |
| * WUR Parameters field format from WUR AP
 |

(…existing texts ….)

A WUR AP indicates the start time of a WUR duty cycle schedule in the WUR Duty Cycle Start Time subfield of the WUR Parameters field in the WUR Mode element (see 30.6 (WUR duty cycle operation)).(#2729)

(…existing texts ….)