IEEE P802.11
Wireless LANs

|  |
| --- |
| Comment Resolution on TWT |
| Date: May 10th, 2023 |
| Author(s): |
| Name | Affiliation | Address | Phone | Email |
| Rubayet Shafin | Samsung Research America | 6625 Excellence Way., Plano, TX, 75023 |  | r.shafin@samsung.com |
| Boon Loong Ng |  |  |
| Peshal Nayak |  |  |
| Vishnu Ratnam |  |  |
| Yue Qi |  |  |
| Elliot Jen |  |  |

 Abstract

This submission proposes resolutions for the following 9 comments received for TGbe LB271:

* 9 CIDs: 15232, 15732, 15742, 17956, 15704, 15243, 15242, 15741, 18254

SP: Do you agree to the resolutions provided in doc 11-23/757r1 for the following CIDs for inclusion in the latest 11be draft?

15232, 15732, 15742, 17956, 15704, 15243, 15242, 15741, 18254

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Fixed typo.

***TGbe editor: Please note Baseline is 11be D3.1***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Pg/Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 15232 | Akira Kishida | 619.03 | How non-AP MLD can utilize the aligned schedule among multiple links should be clarified. | Link ID of the aligned link should be indicated and clarified when the target wake times on the link aligned without receiving a broadcast TWT schedule on the link. | **Revised.**The topic of adding a link identifier, e.g. a Link ID or a Link ID Bitmap, while advertising an aligned TWT schedule was discussed heavily in the group in the previous round of comment collection. However, the group could not reach a consensus on adding this identifier. For prior discussion on this, please refer to doc 11-22/1774. The aligned schedule operation is also possible without an identifier of the link(s) on which the schedule is available. In order to clarify the procedure, an example is added.**TGbe editor, please make the changes tagged by CID #15243 in 11-23/757r1.** |
| 15732 | KENGO NAGATA | 619.03 | "The TWT scheduling AP affiliated with an AP MLD, while announcing a broadcast TWT schedule in its BSS, may indicate whether the schedule is an aligned schedule. An aligned schedule is a broadcast TWT schedule that is available across multiple links such that the target wake times of the schedules on the multiple links are aligned."It is not clear how the aligned schedule is used at the non-AP MLD. | If the aligned schedule is supposed to be used to know the target wake times on the aligned link without receiving a broadcast TWT schedule on the aligned link, at least Link ID of the aligned link should be indicated as well. | **Revised.**The topic of adding a link identifier, e.g. a Link ID or a Link ID Bitmap, while advertising an aligned TWT schedule was discussed heavily in the group in the previous round of comment collection. However, the group could not reach a consensus on adding this identifier. For prior discussion on this, please refer to doc 11-22/1774. The aligned schedule operation is also possible without an identifier of the link(s) on which the schedule is available. In order to clarify the procedure, an example is added.**TGbe editor, please make the changes tagged by CID #15243 in 11-23/757r1.** |
| 15742 | KENGO NAGATA | 619.03 | It is not clear how TWT scheduled STAs use the indication whether the schedule is an aligned schedule. For example, the indication may be used to know an estimated target wake time on the aligned link even when a broadcast TWT schedule was not received on the aligned link. However, in this case an indication of which link is aligned should be needed as well. | Please change to the following language."The TWT scheduling AP affiliated with an AP MLD, while announcing a broadcast TWT schedule in its BSS, may indicate whether the schedule is an aligned schedule and the Link ID which indicates the aligned link." | **Revised.**The topic of adding a link identifier, e.g. a Link ID or a Link ID Bitmap, while advertising an aligned TWT schedule was discussed heavily in the group in the previous round of comment collection. However, the group could not reach a consensus on adding this identifier. For prior discussion on this, please refer to doc 11-22/1774. The aligned schedule operation is also possible without an identifier of the link(s) on which the schedule is available. In order to clarify the procedure, an example is added.**TGbe editor, please make the changes tagged by CID #15243 in 11-23/757r1.** |
| 17956 | Yuchen Guo | 243.27 | Aligned subfield doesn't work since non-AP MLD doesn't' know which links have the aligned TWT SP. | need to provide an aligned TWT link bitmap | **Revised.**The topic of adding a link identifier, e.g. a Link ID or a Link ID Bitmap, while advertising an aligned TWT schedule was discussed heavily in the group in the previous round of comment collection. However, the group could not reach a consensus on adding this identifier. For prior discussion on this, please refer to doc 11-22/1774. The aligned schedule operation is also possible without an identifier of the link(s) on which the schedule is available. In order to clarify the procedure, an example is added.**TGbe editor, please make the changes tagged by CID #15243 in 11-23/757r1.** |
| 15704 | Yousi Lin | 243.27 | Aligned subfield only indicates whether there is a schedule on other link that is aligned with this schedule. It does not work since the non-AP MLD does not know on which links are the aligned TWT. Need a link bitmap to indicate the links that have aligned TWT SP. | as in comment | **Revised.**The topic of adding a link identifier, e.g. a Link ID or a Link ID Bitmap, while advertising an aligned TWT schedule was discussed heavily in the group in the previous round of comment collection. However, the group could not reach a consensus on adding this identifier. For prior discussion on this, please refer to doc 11-22/1774. The aligned schedule operation is also possible without an identifier of the link(s) on which the schedule is available. In order to clarify the operation of the aligned TWT schedule, an example is added.**TGbe editor, please make the changes tagged by CID #15243 in 11-23/757r1.** |
| 15243 | Akira Kishida | 619.03 | The use case of an aligned schedule is unclear. Please add concrete examples and figure(s) for the explanation. | As in the comment. | **Revised.**In order to clarify the operation of the aligned TWT schedule, an example is added for illustration.**TGbe editor, please make the changes tagged by CID #15243 in 11-23/757r1.** |
| 15242 | Akira Kishida | 619.03 | It should be clarified that target wake times over multiple links should be synchronized each other for the Broadcast TWT schedule, which is the aligned schedule. In addition, it should also be clarified that any specified link can be utilized according to the types of traffic flow in the aligned schedule. In other words, it should be clarified whether a TWT scheduled STA affiliated with a non-AP MLD may decide at least one link for transmission among aligned links. At this point, TWT SP should be synchronized among all links. | As in the comment. | **Rejected.**Once two STAs affiliated with a non-AP MLD become members of aligned TWT schedules on two links, the STAs operate independently during the corresponding TWT SPs on those links. In terms of STA’s behavior point of view, there are no changes to the baseline behavior. |
| 15741 | KENGO NAGATA | 619.03 | "An aligned schedule is a broadcast TWT schedule that is available across multiple links such that the target wake times of the schedules on the multiple links are aligned."It is not clear whether a TWT scheduled STA affiliated with a non-AP MLD may decide a link it uses for transmission among aligned links by itself, when the target wake time of the schedules on the multiple links are syncronized. | Please add the following language."A TWT scheduled STA affiliated with a non-AP MLD may decide a link it uses for transmission among aligned links by itself, when the target wake time of the schedules on the multiple links are aligned." | **Rejected.**Once two STAs affiliated with a non-AP MLD become members of aligned TWT schedules on two links, the STAs operate independently during the corresponding TWT SPs on those links. In terms of STA’s behavior point of view, there are no changes to the baseline behavior.  |

**35.3.24 TWT operation**

**35.3.24.3 Broadcast TWT operation**

***TGbe editor: Please add the following paragraph and Figure 35-yyy (An example of aligned TWT schedule) after the second paragraph in clause 35.3.24.3 (Broadcast TWT operation) (#15243).***

(#15243) Figure 35-yyy (An example of aligned TWT schedule) illustrates an example of aligned schedule operation. In this example, the AP MLD has three affiliated APs: AP1 operates on Link 1, AP2 operates on Link 2, and AP3 operates on Link 3; the non-AP MLD has three affiliated non-AP STAs: STA1 operates on Link 1, STA2 operates on Link 2, and STA3 operates on Link 3. As depicted in the figure, during the initial portion of the illustration, all three non-AP STAs affiliated with the non-AP MLD are in Doze state. At some point in time, STA1 wakes up to receive the Beacon frame on Link 1 and observes that AP1 is advertising a broadcast TWT schedule, Schedule-1, on Link 1. AP1, in the Beacon frame, indicates that Schedule-1 is an aligned schedule. STA1 sends a TWT request to AP1 requesting to join Schedule-1, and AP1 accepts the request. Both STA2 and STA3 intend to establish broadcast TWT schedules, on Link 2 and Link3 respectively, that are aligned with Schedule-1 on Link 1. Accordingly, both STA2 and STA3 wake up to receive the Beacon frames on Link 2 and Link 3, respectively, to identify the presence of such schedules, on the corresponding links, that are aligned with Schedule-1 on Link 1. STA2 observes that there is no broadcast TWT schedule advertised on Link 2 that is aligned with Schedule-1 on Link 1 and goes back to the Doze state after receiving the Beacon frame. STA3 observes that there is a broadcast TWT schedule, Schedule-2, advertised on Link 3 that is aligned with Schedule-1 on Link 1. STA3 sends a TWT request to AP3 to join Schedule-2 on Link 3 and AP3 accepts the request.



**Figure 35-yyy: An example of aligned TWT schedule (#15243)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Pg/Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 18254 | Li-Hsiang Sun | 619.07 | "Other TWT parameters of the aligned schedules on those multiple links remainthe same as each other"Should the broadcast TWT ID on aligned links also be the same ? | add exception for broadcast TWT ID | **Revised.** Agree in principle. The Broadcast TWT IDs of two aligned schedules on two link can be the same or different.**TGbe editor, please make the changes tagged by CID #18254 in 11-23/757r1.** |

***TGbe editor: Please revise the first paragraph in clause 35.3.24.3 (Broadcast TWT operation) as follows.***

A TWT scheduling AP affiliated with an AP MLD, while announcing a broadcast TWT schedule in the AP’s BSS, may indicate whether the schedule is an aligned schedule. An aligned schedule is a broadcast TWT schedule that is available across multiple links such that the target wake times of the schedules on the multiple links are aligned. The Broadcast TWT IDs of the aligned schedules can be the same or different. (#18254) Other TWT parameters of the aligned schedules on those multiple links remain the same as each other.