IEEE P802.11
Wireless LANs

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| CC50 CR for CIDs 1437, 1906, 1907, 1908Overlapping Quiet Interval for Co-RTWT |
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|  |  |  |  |  |

Abstract

This submission proposes resolutions about Co-RTWT for the following CIDs received for TGbn CC50 Comment Resolution

CIDs: 1437, 1906, 1907, 1908

# Comments (CIDS) resolved:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Clause(P, L)** | **Comment** | **Proposed Change** | **Resolution** |
| 1906 | 37.8.2.4.2(74, 60) | Need to add a request method for protecting a Co-RTWT from legacy non-AP STAs associated with Co-RTWT coordinated AP.There is no mechanism defined to protect the Co-RTWT SP from legacy non-AP STAs associated with Co-RTWT coordinated AP.In subclause 35.8.4.2 (Quiet STAs during R-TWT SPs), R-TWT scheduling AP may schedule at most one quiet interval that overlaps with an R-TWT SP. | As in commentPlease define a mechanism to request the protection of Co-RTWT from legacy STA that is associated with Co-RTWT coordinated AP.For example, Co-RTWT requesting AP may request a setting of overlapping quiet interval if the AP scheduled the quiet interval that overlaps with an R-TWT SP | RevisedAgree with the commenter. TGbn editor: please make the change with #1906 tag in this document. |
| 1907 | 37.8.2.4.2(74, 60) | Need to define a Co-RTWT negotiation rule about overlapping quiet interval to protect the Co-RTWT SP from legacy non-AP STA.Whether to accept overlapping quiet interval setting or not depends on the Co-RTWT coordinated APThis does not affect the outcome of Co-RTWT negotiation.For example, since Co-RTWT coordinated AP has only one STA that supports R-TWT, the AP cannot set the overlapping quiet interval that is requested by Co-RTWT requesting AP. | Please define a Co-RTWT negotiation rule about overlapping quiet interval | RevisedAgree with the commenter. TGbn editor: please make the change with #1907 tag in this document. |
| 1908 | 37.8.2.4.3(75, 19) | There is no announcement mechanism defined to protect the Co-RTWT SP from legacy non-AP STAs associated with Co-RTWT coordinated AP when the AP has only legacy STAs that do not support R-TWT. | Please add the Co-RTWT announcement rule when the Co-RTWT coordinated AP has no associated non-AP STA that supports R-TWT. | RevisedAgree with the commenter. TGbn editor: please make the change with #1908 tag in this document. |
| 1437 | 37.8.2.4.4(75, 33) | If the Co-RTWT SP indicates a specific SP for the whole Co-RTWT operation, how does it coexist with legacy STAs that do not interpret Co-RTWT SP? Some updates regarding the Quiet setting rule will be required. | Please consider to specify. | RevisedAgree with the commenter. TGbn editor: please make the change with #1908 tag in this document. |

**Proposed resoluion:**

***TGbn editor: Please apply the following changes to the body of subclause 9.4.2.aa3.2.5 (Co-RTWT profile)***

**9.4.2 Elements**

**9.4.2.1 General**

**9.4.2.aa3 MAPC element**

**9.4.2.aa3.1 General**

**9.4.2.aa3.2 MAPC Scheme Info field**

**9.4.2.aa3.2.5 Co-RTWT profile**

The MAPC Scheme Type field is set to the value for Co-RTWT as indicated in Table 9-K2.

For each MAPC Scheme Request field, carried in the Co-RTWT profile:

* The MAPC Info field includes a Broadcast TWT ID field carrying the identifier of a specific R-TWT schedule.
* The Last MAPC Request field is set to 0 to indicate that the Co-RTWT profile carries another MAPC Scheme Request field that follows this MAPC Scheme Request field. The Last MAPC Request field is set to 1 to indicate that this is the last MAPC Scheme Request field in the Co-RTWT profile.
* The MAPC Scheme Parameter Set is not included.
* The MAPC Request Parameter Set field contains a Co-RTWT Parameter Set field with format defined in Figure 9-K6 (Co-RTWT Parameter Set field format).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Target Wake Time | Nominal Minimum TWT Wake Duration | TWT Wake Interval Mantissa | Service Period Info |
| Octets: | 8 | 1 | 2 | 2 |

**Figure 9-K6—Co-RTWT Parameter Set field format**

The Target Wake Time field contains an unsigned integer corresponding to the Co-RTWT SP start time expressed in terms of the TSF of the Co-RTWT requesting AP.

The Nominal Minimum TWT Wake Duration field indicates the nominal duration of the Co-RTWT SPs, in units of 256 $μs$.

The TWT Wake Interval Mantissa field is set to the value of the mantissa of the TWT wake interval value in microseconds, base 2.

The format of the Service Period Info field is defined in Figure 9-K7 (Service Period Info format).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B0 B4 | B5 B12 | B13 B14 | B15 |
|  | TWT Wake Interval Exponent | Broadcast TWT Persistence | Restricted TWT Schedule Info | Overlapping Quiet Interval Scheduled |
| Bits: | 5 | 8 | 2 | 1 |

**Figure 9-K7— Service Period Info field format (#1906)**

The TWT Wake Interval Exponent field is set to the value of the exponent of the TWT wake interval value in microseconds, base 2. The TWT wake interval is the time between successive Co-RTWT SPs start times and is equal to (TWT Wake Interval Mantissa) × $2^{(TWT Wake Interval Exponent)}$.

The Broadcast TWT Persistence field indicates the number of TBTTs of the Co-RTWT requesting AP during which the Co-RTWT SPs corresponding to this Co-RTWT Parameter set are present. The number of TBTTs of the Co-RTWT requesting AP during which the Co-RTWT SPs are present is equal to the value in the Broadcast TWT Persistence field plus 1, except that the value 255 indicates that the Co-RTWT SPs are present until explicitly terminated.

The Restricted TWT Schedule Info field is defined in Table 9-349a (Restricted TWT Schedule Info field values).

The Overlapping Quiet Interval Scheduled field indicates whether the Co-RTWT requesting AP schedules an overlapping quiet interval that overlaps with the R-TWT SP corresponding to this Co-RTWT Parameter set.

The Overlapping Quiet Interval Scheduled field is set to 1 to indicate that the Co-RTWT requesting AP schedules the overlapping quiet interval that overlaps with the R-TWT SP. The Overlapping Quiet Interval Scheduled field is set to 0 to indicate that the Co-RTWT requesting AP does not schedule the overlapping quiet interval that overlaps with the R-TWT SP. **(#1906)**

**37.8 Multi-AP coordination (MAPC) framework**

**37.8.2 Procedures for specific multi-AP coordination schemes**

**37.8.2.4 Coordinated R-TWT (Co-RTWT)**

***TGbn editor: Please apply the following changes to the body of subclause 37.8.2.4 (Coordinated R-TWT (Co-RTWT))***

**37.8.2.4.1 General**

**37.8.2.4.2 Co-RTWT negotiations**

A Co-RTWT requesting AP that follow the rules defined in 37.8.1.3 (MAPC agreement negotiation) to establish, update, or tear down Co-RTWT agreement(s) is also a MAPC requesting AP and additionally follows the rules defined in this subclause.

The Co-RTWT requesting AP shall include a Co-RTWT profile in the MAPC element carried in a transmitted individually addressed MAPC Negotiation Request frame. The Co-RTWT profile shall include one or more MAPC Scheme Request fields where each corresponds to an R-TWT schedule. The Broadcast TWT ID field included in the MAPC Info field of the MAPC Request Control field identifies the R-TWT schedule, and shall be set equal to the value of the Broadcast TWT ID field of the Restricted TWT Parameter Set field corresponding to the R-TWT schedule that is announced by the Co-RTWT requesting AP in its own BSS (see 35.8.3.1 (Rules for R-TWT scheduling AP)). The MAPC Operation Type shall be set to 0 to establish a new Co-RTWT agreement, to 1 to update an existing Co-RTWT agreement, or to 2 to teardown an existing Co-RTWT agreement (see Table 9-K5). If the MAPC Operation Type is set to 0 or 1, the MAPC Request Parameter Set field defined in 9.4.2.aa3.2.5 (Co-RTWT profile) shall be included in the MAPC Scheme Request field.

If the MAPC Request Parameter Set field is included in the MAPC Scheme Request field for an R-TWT schedule, the MAPC Request Parameter Set field shall specify the associated Co-RTWT parameter set as follows: the Target Wake Time field, the Nominal Minimum TWT Wake Duration field, the TWT Wake Interval Mantissa field, the TWT Wake Interval Exponent field, the Broadcast TWT Persistence field, and the Restricted TWT Schedule Info field shall be set equal to the value of the Target Wake Time field, Nominal Minimum TWT Wake Duration field, the TWT Wake Interval Mantissa field, the TWT Wake Interval Exponent field, the Broadcast TWT Persistence field, the Restricted TWT Schedule Info field, and the Overlapping Quiet Interval Scheduled field, respectively, as reported in the Restricted TWT Parameter Set field corresponding to the R-TWT schedule that is announced by the Co-RTWT requesting AP in its own BSS as defined in 35.8.3.1.

An AP that responds to a Co-RTWT requesting AP in a MAPC agreement negotiation for Co-RTWT agreement(s) is also a MAPC responding AP and responds by following the rules defined in 37.8.1.3.

An AP that has established one or more MAPC agreements for Co-RTWT with a Co-RTWT requesting AP is a Co-RTWT coordinated AP.

Each Co-RTWT agreement is uniquely identified by the <broadcast TWT ID, MAC address> tuple, where the broadcast TWT ID is the value of the Broadcast TWT ID field (see 9.4.2.aa3.2.5 (Co-RTWT profile)) and is greater than 0 and the MAC address is the address of the Co-RTWT requesting AP.

**37.8.4.2.3 Co-RTWT announcement rules**

As part of extending protection for R-TWT schedule(s) of a Co-RTWT requesting AP, the Co-RTWT coordinated AP shall advertise the active R-TWT schedule(s) in its transmitted Beacon frames if the Co-RTWT coordinated AP has at least one associated STA that supports R-TWT.

NOTE —The Co-RTWT coordinated AP’s associated STA(s) that support R-TWT follow the rules defined in 35.8.4.1 (TXOP and backoff procedure rules for R-TWT SPs) for the R-TWT schedule(s).

To advertise activeR-TWT schedule(s) of a Co-RTWT requesting AP, the Co-RTWT coordinated AP shall announce R-TWT schedule(s) information by including Restricted TWT Parameter Set field(s) in the Broadcast TWT element defined in 9.4.2.198 (TWT element) and contained in transmitted Management frame(s) as specified in 26.8.3 (Broadcast TWT operation), 35.8 (Restricted TWT (R-TWT)), and by additionally following the rules defined in this subclause.

When a Co-RTWT coordinated AP advertises an active R-TWT schedule of a Co-RTWT requesting AP, the Co-RTWT coordinated AP shall include a Restricted Parameter Set field describing the R-TWT schedule in the Broadcast TWT element:

* With the Restricted TWT Schedule Info subfield set to 3, and
* With the Broadcast TWT ID subfield set to 31.

When a Co-RTWT coordinated AP in a co-hosted BSSID set advertises an active R-TWT schedule of a Co-RTWT requesting AP, then all the other APs in the same co-hosted BSSID set are Co-RTWT coordinated APs and shall advertise the same R-TWT schedule:

* With the Restricted TWT Schedule Info subfield set to 3, and
* With the Broadcast TWT ID subfield set to 31.

When a Co-RTWT coordinated AP advertises an active R-TWT schedule of a Co-RTWT requesting AP, the Co-RTWT coordinated AP shall set all the other parameters of the Restricted TWT Parameter Set field as follows:

* The TWT Wake Interval Exponent field, the TWT Wake Interval Mantissa field shall be set equal to the corresponding value in the Co-RTWT parameter set,
* The Target Wake Time field shall be set to $TSF\_{Ref}$ [10:25], where $TSF\_{Ref}$ corresponds to the start time of the R-TWT scheduled for this Restricted TWT parameter set that will occur after the Co-RTWT coordinated AP has queued for transmission the frame that contains the TWT element. The value of $TSF\_{Ref}$ is obtained by converting the value of the Target Wake Time field of the Co-RTWT parameter set received from the Co-RTWT requesting AP to the Co-RTWT coordinated AP’s local TSF.
* The four MSBs of the Nominal Minimum TWT Wake Duration/Target Wake Time Extension field shall be set to $TSF\_{Ref}$ [6:9].
* TSF timer at which that R-TWT is scheduled has bits 0 to 5 equal to 0 and bits 26 to 63 equal to the same value as the respective bits in the current value of the TSF timer of the Co-RTWT coordinated AP.
* The Broadcast TWT Persistence subfield for the R-TWT schedule shall be set to a value equal to the number of the Co-RTWT coordinated AP’s TBTTs for which the R-TWT schedule of the Co-RTWT requesting AP is expected to be in existence, counting forward from the current Co-RTWT coordinated AP’s TBTT. The value shall be determined by the Co-RTWT coordinated AP to include the TBTT immediately following the time at which the R-TWT schedule of the Co-RTWT requesting AP ceases to exist, that is obtained by the Broadcast TWT Persistence field of the most recent Co-RTWT parameter set. The Co-RTWT coordinated AP may change the value of the Broadcast TWT Persistence subfield for any Broadcast TWT within any transmitted TWT element.

NOTE —A non-AP STA does not request to establish membership in an R-TWT schedule advertised by the R-TWT scheduling AP with the Restricted TWT Schedule Info subfield set to 3 (see 35.8.3.2 (Rules for the R-TWT scheduled STA)).

The Co-RTWT coordinated AP may advertise the schedule(s) of an overlapping quiet interval that overlaps with the advertised active R-TWT schedule(s) in its transmitted Beacon frame. **(#1908)**

The Co-RTWT coordinated AP shall not advertise the schedule(s) of the overlapping quiet interval in its transmitted Beacon frame, unless at least one of the following conditions is met:

* the Co-RTWT requesting AP sets the Overlapping Quiet Interval Scheduled field to 1,
* the Co-RTWT coordinated AP advertises the active R-TWT schedule(s) in its transmitted Beacon frames. **(#1908)**

NOTE — To advertise the overlapping quiet interval, the Co-RTWT coordinated AP follows the rules defined in 35.8.4.2 (Quieting STAs during R-TWT SPs). **(#1908)**

**References:**

[1] 11-25/0599r13: PDT-MAC MAPC Signaling and Protocol Aspects, Giovanni Chisci (Qualcomm Technologies Inc.)

[2] 11-25/0600r13: PDT-MAC Co-RTWT Signaling and Protocol Aspects, Giovanni Chisci (Qualcomm Technologies Inc.)