IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CC34 Comment Resolution for Sync PPDU start time | | | | |
| Date: 2021-05-17 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Dmitry Akhmetov | Intel Corporation |  |  | Dmitry.akhmetov@intel.com |
| Laurent Cariou | Intel Corporatrion |  |  |  |
| Das Dibakar | Intel Corporation |  |  |  |
| Duncan Ho | Qualcomm |  |  |  |
| Matthew Fischer | Broadcomm |  |  |  |
| Young Hoon Kwon | NXP |  |  |  |
| Yongho Seok | Mediatek |  |  |  |

Abstract

This submission proposes comment resolutions for the following CIDs related to 13.6 Start time sync PPDUs medium access in CC34:

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Added CID 1772 to the list, updated authors list, added SP text, changed order of CIDs in the table
* Rev 2: Postponed CID 2712 resolution as requested by the commenter
* Rev 3: removed a typo (non-AP MLD)
* Rev4: added “and there is a frame available for transmission” to Note 1. Changed order of some CIDs in the table
* Rev5: added “for that MLD” in the first sentence about “NSTR link pair”
* Rev6: added resolution for TBD: “Note 2 – whether to extend this mechanism to STR MLD is TBD”
* Rev7: merged “Note 2” into main main text of subbulet (3) per received comment
* Rev8: replaced aSlotTime (9us) with 4us per offline discussion

1439

1501

1502

1507

1509

1510

1511

1512

1513

1514

1703

1757

1772

1797

2211.1 – the comment #2211 has two questions, it is easier to split it in two CRs

2211.2

2142

2434

2435

2712

2718

2740

2741

3141

3142

3143

3145

3205

3323

3398

3399

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Clause Number** | **Page.**  **Line** | **Comment** | **Proposed Change** | **Resolution** |
| 1797 | Insun Jang | 35.3.13.6 | 144.26.6 | A TXOP holder is an STA (i.e., STA-level). However, the sentence is mentioning that a non-STR MLD can be a TXOP holder, which is not clear. Each STA of the non-STR MLD would be a TXOP holder on the corresponding link. | Based on the comment, please change the sentence as follows: Each STA affilaited with a non-STR MLD contending for their WM to become TXOP holders and that aligns the start times of the PPDUs scheduled for transmission on their operating links shall ensure that the EDCA count down procedure is completed in all the links. | Revised  Agree, made changes following this and other commenters on this topic  TGbe editor to make the changes with the CID tag (#1797) in doc.: IEEE 802.11-20/0514r8  [https://mentor.ieee.org/802.11/dcn/21/11-21-0514-08-00be-cc34-cr-for-clause-35-3-13-6-sync-ppdu-start-time.docx] |
| 2142 | Laurent Cariou | 35.3.13.6 | 144.26 | first sentence: STA of MLD becomes TxOP holder, not the MLD | as in comment | Revised.  Agree, made changes following this and other commenters on this topic  TGbe editor to make the changes with the CID tag (#2142) in doc.: IEEE 802.11-20/0514r8  [https://mentor.ieee.org/802.11/dcn/21/11-21-0514-08-00be-cc34-cr-for-clause-35-3-13-6-sync-ppdu-start-time.docx] |
| 3323 | Yunbo Li | 35.3.13.6 | 144.26 | because the non-STR MLD transmit on more than one link, "become a TXOP holder" should be changed "become TXOP holders" | as in comment. | Revised.  Made changes following this and other commenters on this topic  TGbe editor to make the changes with the CID tag (#3323) in doc.: IEEE 802.11-20/0514r8  [https://mentor.ieee.org/802.11/dcn/21/11-21-0514-08-00be-cc34-cr-for-clause-35-3-13-6-sync-ppdu-start-time.docx] |
| 2434 | namyeong kim | 35.3.13.6 | 144.26 | we agreed that a pair of links that is not indicated as STR shall be indicated as NSTR.  Modify "non-STR MLD" to "NSTR MLD". | Please see comment | Revised.  We do not have NSTR MLD definition, instead we have an MLD operating on a pair on NSTR links, changed accordingly  TGbe editor to make the changes with the CID tag (#2434) in doc.: IEEE 802.11-20/0514r8  [https://mentor.ieee.org/802.11/dcn/21/11-21-0514-08-00be-cc34-cr-for-clause-35-3-13-6-sync-ppdu-start-time.docx] |
| 2718 | Ryuichi Hirata | 35.3.13.6 | 144.26 | "STR MLD" and "non-STR MLD" are not defined. | Define "STR MLD" and "non-STR MLD" | Revised  replaced non-STR mld with an MLD operating on a pair of NSTR links  TGbe editor to make the changes with the CID tag (#2718) in doc.: IEEE 802.11-20/0514r8  [https://mentor.ieee.org/802.11/dcn/21/11-21-0514-08-00be-cc34-cr-for-clause-35-3-13-6-sync-ppdu-start-time.docx] |
| 1772 | Ilya Levitsky | 35.3.13.6 | 144.26 | Change all occurancies of "non-STR" to "NSTR" | As in comment | Revised  Made changes across clause 35.3.13.6  TGbe editor to make the changes with the CID tag (#2211.1) in doc.: IEEE 802.11-20/0514r8  [https://mentor.ieee.org/802.11/dcn/21/11-21-0xxx -00-00be-cc34-cr-sync.docx |
| 3141 | Yongho Kim | 35.3.13.6 | 145.27 | "EDCA count down procedure" is not defined in IEEE Std 802.11(TM) -2020. In IEEE Std 802.11(TM) -2020, EDCA TXOP and EDCAF are used to define the procedure. Please define the procedure using the terminologies in IEEE Std 802.11(TM) -2020 | As in comment | Revised  Reworded as following:  “that the EDCA rules on each link permits access to the medium”  TGbe editor to make the changes with the CID tag (#3141) in doc.: IEEE 802.11-20/0514r8  [https://mentor.ieee.org/802.11/dcn/21/11-21-0514-08-00be-cc34-cr-for-clause-35-3-13-6-sync-ppdu-start-time.docx] |
| 2435 | namyeong kim | 35.3.13.6 | 144.45 | we agreed that a pair of links that is not indicated as STR shall be indicated as NSTR.  Modify "non-STR MLD" to "NSTR MLD". | Please see comment | Revised.  We do not have NSTR MLD definition, instead we have an MLD operating on a pair on NSTR links  TGbe editor to make the changes with the CID tag (#2435) in doc.: IEEE 802.11-20/0514r8  [https://mentor.ieee.org/802.11/dcn/21/11-21-0514-08-00be-cc34-cr-for-clause-35-3-13-6-sync-ppdu-start-time.docx] |
| 1510 | DmitryAkhmetov | 35.3.13.6 | 146.40 | -- The STA may initiate transmission on a link when the medium is idle and one of the following  conditions is met:  \* The backoff counter of the STA reaches zero on a slot boundary of that link.  The backoff counter of the STA is already zero, and the backoff counter of another STA of the affiliated MLD reaches zero on a slot boundary of the link that the other STA operates.  Medium idle normally refers to physical medium status. A STA in WAIT state may have its NAV set by some other transmission and still be in WAIT state. | clarify | Revised  added “as indicated by the physical and virtual CS mechanisms"  TGbe editor to make the changes with the CID tag (#1510) in doc.: IEEE 802.11-20/0514r8  [https://mentor.ieee.org/802.11/dcn/21/11-21-0514-08-00be-cc34-cr-for-clause-35-3-13-6-sync-ppdu-start-time.docx] |
| 1757 | Hanseul Hong | 35.3.13.6 | 144.35 | Following this operation, a frame may be transmitted when it is a slot boundary on which the backoff counter is decremeted from 1 to 0. However, the current EDCA operation actually transmits a frame when it is already 0 at the slot boundary(one slot boundary later). It is not clear why it should transmit one slot boundary earlier. | Modify the transmission time so that it is aligned with current EDCA operation | Revised.  Changed text to reflect intended behavior  TGbe editor to make the changes with the CID tag (#1757) in doc.: IEEE 802.11-20/0514r8  [https://mentor.ieee.org/802.11/dcn/21/11-21-0514-08-00be-cc34-cr-for-clause-35-3-13-6-sync-ppdu-start-time.docx] |
| 3399 | Zhou Lan | 35.3.13.6 | 144.45 | Please specify the condition to use "If the backoff counter of the STA has already reached zero, it may perform a new backoff procedure. CW[AC] and QSRC[AC] are left unchanged." | As stated in the comment | Revised  Added clarification “Note 1”.  Existing text imply that a STA to initiate transmission on a link shall met condition (a) or (b). If bk counter of a STA already =0, it shall perform new backoff to initiate transmission under rule (a)  TGbe editor to make the changes with the CID tag (#3399) in doc.: IEEE 802.11-20/0514r8  [https://mentor.ieee.org/802.11/dcn/21/11-21-0514-08-00be-cc34-cr-for-clause-35-3-13-6-sync-ppdu-start-time.docx] |
| 1439 | Chien-Fang Hsu | 35.3.13.6 | 144.45 | When the STA decides to perform a new backoff procedure, should it wait AIFS[AC] again? | Clarify it | Revised  Added clarification note following this and other commeters on this topic.  TGbe editor to make the changes with the CID tag (#1439) in doc.: IEEE 802.11-20/0514r8  [https://mentor.ieee.org/802.11/dcn/21/11-21-0514-08-00be-cc34-cr-for-clause-35-3-13-6-sync-ppdu-start-time.docx] |
| 1509 | Dmitry Akhmetov | 35.3.13.6 | 145.45 | if the backoff counter of the STA has already reached zero, it may perform a new backoff procedure.  CW[AC] and QSRC[AC] are left unchanged.  Normally the STA perform new backoff procedure when it detect medium change from BUSY to IDLE starting with EIFS/DIFS/AIFSN after change of medium status. In case of SYNC access STA may decide to perform new backoff procedure even when medium on that link is IDLE. Clarification needed on STA behavior in such case | clarify | Revised  Added clarification note.  TGbe editor to make the changes with the CID tag (#1509) in doc.: IEEE 802.11-20/0514r8  [https://mentor.ieee.org/802.11/dcn/21/11-21-0514-08-00be-cc34-cr-for-clause-35-3-13-6-sync-ppdu-start-time.docx] |
| 3142 | Yongho Kim | 35.3.13.6 | 144.30 | NOTE1 suggests to follow 10.23.2.4. However, 10.23.2.4 EDCAF is defined for the primary channel. Description shall be changed to include multi-link operatio | As in comment | Rejected  The description is for channel access on a link. At each link, the channel access is performed on a primary channel of that link and follow procedures described in 10.23.2.4. After obtaining TXOP on a primary channel a STA follow procedures described in 10.23.2.5 to transmit a wider mask PPDU |
| 1501 | Dibakar Das | 35.3.13.6 | 144.35 | Even though an EDCAF corresponding to AC\_BE\_ finishes contending earlier than AC\_VO\_, it wont be allowed to transmit if both are waiting at zero. This may create an unfairness issue | Allow transmission from either AC in an implementation-specific way and allow the other AC to encounter an internal collision. | Revised  Following this and other commenters on this topic , added corresponding paragraph  TGbe editor to make the changes with the CID tag (#1501) in doc.: IEEE 802.11-20/0514r8  [https://mentor.ieee.org/802.11/dcn/21/11-21-0514-08-00be-cc34-cr-for-clause-35-3-13-6-sync-ppdu-start-time.docx] |
| 1502 | Dibakar Das | 35.3.13.6 | 144.43 | Suppose, an EDCAF for AC\_BE counts down to zero on two links. Does the transmission start immediately ? If not, while waiting at zero, some other EDCAF also counts down to zero on one or both links. Which EDCAFs shall transmit ? | Clarify. | Revised  Following this and other commenters on this topic , added corresponding paragraph  TGbe editor to make the changes with the CID tag (#1502) in doc.: IEEE 802.11-20/0514r8  [https://mentor.ieee.org/802.11/dcn/21/11-21-0514-08-00be-cc34-cr-for-clause-35-3-13-6-sync-ppdu-start-time.docx] |
| 1512 | Dmitry Akhmetov | 35.13.3.6 |  | Subclause 35.3.13.6 does not clarify behavior when a STA on a link have more than one EDCAF is WAIT state. Example1: EDCAF[VO] of link 1 win contention but STA decide to enter WAIT state. Later EDCAF[BE] win contention on link1 and decide to WAIT as well. Afetr that EDCAF[BE] of a STA on link 2 finish coundown and decide to transmit triggering STA on link 1 for transmission. Example 2: EDCAF[VO] of link 1 win contention and decide to WAIT. Later EDCAF[BE] win contention on link1 and decide to transmit. | Specify behavior when more than one EDCAF that finishe countdown at a different time and initiate TXOP on a link. Potential candidates are sections 10.23.2.3 (EDCA TXOPs) and 10.23.2.4 (Obtaining EDCA TXOP) | Revised  Following this and other commenters on this topic , added corresponding paragraph  TGbe editor to make the changes with the CID tag (#1512) in doc.: IEEE 802.11-20/0514r8  [https://mentor.ieee.org/802.11/dcn/21/11-21-0514-08-00be-cc34-cr-for-clause-35-3-13-6-sync-ppdu-start-time.docx] |
| 2211.2 | Liwen Chu | 35.3.13.6 | 144.24 | The following need to be clarified: 2) mutiple backoff counters become 0 when waiting for counting down to 0 of another link's backoff counter. | as mentioned in the comment | Revised  Added a paragraph with clarification  TGbe editor to make the changes with the CID tag (#2211) in doc.: IEEE 802.11-20/0514r8  [https://mentor.ieee.org/802.11/dcn/21/11-21-0514-08-00be-cc34-cr-for-clause-35-3-13-6-sync-ppdu-start-time.docx] |
| 3205 | Young Hoon Kwon | 35.3.13.6 | 144.40 | Based on baseline rule, a STA shall invoke a backoff procedure if the transmission of the final PPDU transmitted by the TXOP holder during the TXOP has completed and the TXNAV timer has expired. And, in this case, if there's nothing to transmit, the backoff counter will stay at zero. If this happens on link1, and later when the non-STR MLD wants to transmit frames on both link1 and link2, the non-STR MLD can only initiate a backoff on link2 and can transmit on both link1 and link2 simultaneously as the backoff counter of the STA on link1 has already reached zero, which is not the intended behavior. Further clarification is needed to resolve this. | As shown in the comment. | Revised  Original behavior in clause 35 provide a STA flexibility not to initiate backoff procedure after the STA with backoff counter that has already zero and has available data for transmission detected medium transition from BUSY to IDLE.  Clause-10 mandate a STA to perform backoff procedure in such cases.  To remove such ambiguity, we propose to follow baseline behavior in such cases  TGbe editor to make the changes with the CID tag (#3205) in doc.: IEEE 802.11-20/0514r8  [https://mentor.ieee.org/802.11/dcn/21/11-21-0514-08-00be-cc34-cr-for-clause-35-3-13-6-sync-ppdu-start-time.docx] |
| 1511 | Dmitry Akhmetov | 35.3.13.6 | 146.40 | -- The STA may initiate transmission on a link when the medium is idle and one of the following  conditions is met:  \* The backoff counter of the STA reaches zero on a slot boundary of that link.  \* The backoff counter of the STA is already zero, and the backoff counter of another STA of the affiliated MLD reaches zero on a slot boundary of the link that the other STA operates. A STA in WAIT state may observe change of the medium from BUSY to IDLE from 3rd party transmission which might be followed by a response frame SIFS after. In case of recovery the retransmission may happen PIFS. In case of erroneous reception shall use EIFS before starting contention. STA in WAIT state shall not transmit during this times even if it observe medium IDLE and NAV is not set | clarify | Revised  Resolution of CID 3205 address this issue as well.  STA shall initiate new backoff after detecting medium transmission from busy to idle which resolve issue of CID 1511  TGbe editor to make the changes with the CID tag (#1511) in doc.: IEEE 802.11-20/0514r8  [https://mentor.ieee.org/802.11/dcn/21/11-21-0514-08-00be-cc34-cr-for-clause-35-3-13-6-sync-ppdu-start-time.docx] |
| 1514 | Dmitry Akhmetov |  |  | 10.23.2.9 TXOP Limits. Needs to be updated to address the case when more than one EDCAF finish countdown in SYNC access case |  | Rejected.  Per proposed #1512 resolution no need to update this subclause |
| 3143 | Yongho Kim | 35.3.13.6 | 144.46 | This procedure does not cover the case where the channel (link) is idle and a backoff procedure is not initiated. | As in the comment. | Rejected  Existing rules already cover this case  10.3.4.2. Basic Access “A STA may transmit an MPDU when it is operating under the DCF access method, when the STA determines that the medium is idle when a frame is queued for transmission, and remains idle for a period of a DIFS, or an EIFS …“  If there is an ongoing backoff/MEDIUM\_BUSY observed on link2 and link 2 has buffered units available for tranmsission, STA of link 1may decide not to transmit 1 and wait for link2.  If link 2 has no buffered data than it is not clear why or how sync transmission can happen. |
| 3145 | Yongho Kim | 35.3.13.6 | 144.46 | What if the backoff procedure was not performed because of idle channel status, is the backoff counter value 0 without the initiation of backoff procedure ? The description does not cover the case where the link was idle without backoff procedure and the other link became busy while waiting for the other link's backoff countdown. It is necessary to define the sync PPDU transmission procedure where one link is idle from the beginning and the other link has to perform backoff procedure. | As in the comment. | Rejected.  From provided description/example, it is not clear what specific use case commenter is trying to address or resolve |
| 2740 | Sanghyun Kim | 35.3.13.6 | 144.40 | It is expected that the cross link information exchange delay of an MLD might be not very small. A STA of an MLD may not know CCA result of the other STA of the same MLD in real-time. So, a STA of an MLD may not know exact slot boundary that the other STA's backoff counter reaches to zero. (The STA may not know whether the CCA result is idle or not at the last slot in the other STA.)  Sync channel access procedure of the STA that has already zero backoff counter should be expressed as a prediction-based operation. | Change "another STA of the affiliated MLD reaches zero" to "another STA of the affiliated MLD is expected to reach zero" | Rejected.  The STA of an MLD with backoff counter that already has reached zero make no prediction when another STA reach or expected to reach zero. Instead, a STA that bk counter already reached zero will transmit when another STA reaches bk=0 |
| 2741 | Sanghyun Kim | 35.3.13.6 | 144.40 | If a STA initiates its transmission at the slot boundary of the other link, the STA's transmission may not aligned with a slot boundary of its link.  All STAs of an MLD shall follow EDCAF rule of baseline, so each STA of an MLD shall initiate its transmission at a slot boundary of that link.  It is recommended to revise the described channel access procedure following baseline. (Regarding the slot boundary) | Revise transmission slot boundary of a STA to a slot boundary of its link.  - STA1 (already zero) may initiate its transmission on a slot boundary that adjacent to a slot boundary of another link. The slot boundary of another link is a slot boundary that backoff counter of STA2 of the affiliated MLD reaches zero. | Revised  There is no expectation on slot alignment between links.  The STA with bk that already zero is expected to perform CCA on-slot boundaries of the link1 it operates. As such one may expect STA1 to initiate transmission on a its respective slot boundary on that link1 after receiving a signal of backoff completion on the other link2. At the same time exact timing and relation between CCA sampling of two links is hard to predict or define.  As such we propose not to mandate STA1 to TX on its respective slot boundary  TGbe editor to make the changes with the CID tag (#2741) in doc.: IEEE 802.11-20/0514r8  [https://mentor.ieee.org/802.11/dcn/21/11-21-0514-08-00be-cc34-cr-for-clause-35-3-13-6-sync-ppdu-start-time.docx] |
| 2211.1 | Liwen Chu | 35.3.13.6 | 144.24 | The following need to be clarified: 1), the resolution of same start time. | as mentioned in the comment | Revised  STA 1 and STA2 transmit on a slot boundary of each respective link, If slot boundaries misaligned too much, the link that start TX first (link 1) may cause CCA of the other link (link2) to indicate medium BUSY depending on start time  Propose to make this implementation dependent and not to mandate initiation of transmission on link 2 under rule (b) to be slot aligned.  TGbe editor to make the changes with the CID tag (#2211.1) in doc.: IEEE 802.11-20/0514r8  [https://mentor.ieee.org/802.11/dcn/21/11-21-0xxx -00-00be-cc34-cr-sync.docx l |
| 1507 | Dmitry Akhmetov | 35.3.13.6 | 144.32 | SYNC channe access is not dependent on any nSTR specific characteristics, a device is not mandated to be nSTR to perform SYNC channel access as described in this clause. It is safe to extend the mechanism to both STR and nSTR cases | Remove Note 2 and remove "non-STR" from line 35 | Revised.  Removed Note 2, removed NSTR specified  Added non-AP for any MLD reference in the text  TGbe editor to make the changes with the CID tag (#1507) in doc.: IEEE 802.11-20/0514r8  [https://mentor.ieee.org/802.11/dcn/21/11-21-0514-08-00be-cc34-cr-for-clause-35-3-13-6-sync-ppdu-start-time.docx] |
| 1703 | GEORGE CHERIAN | 35.3.13.6 | 144.32 | "NOTE 2--Whether to extend this mechanism to STR MLD is TBD"  Remove the NOTE 2. No need to extend to STR cases | As in the comment | Revised.  Removed Note 2, removed NSTR specified  Added non-AP for any MLD reference in the text  TGbe editor to make the changes with the CID tag (#1703) in doc.: IEEE 802.11-20/0514r8  [https://mentor.ieee.org/802.11/dcn/21/11-21-0514-08-00be-cc34-cr-for-clause-35-3-13-6-sync-ppdu-start-time.docx] |
| 3398 | Zhou Lan | 35.3.13.6 | 144.32 | no techinical reason to limit this mechansim to NSTR MLD only. There are benefit for a STR MLD to use this mechanism. Will submit a contribution. | As stated in the comment | Revised.  Removed Note 2, removed NSTR specified  Added non-AP for any MLD reference in the text  TGbe editor to make the changes with the CID tag (#3398) in doc.: IEEE 802.11-20/0514r8  [https://mentor.ieee.org/802.11/dcn/21/11-21-0514-08-00be-cc34-cr-for-clause-35-3-13-6-sync-ppdu-start-time.docx] |
| 2712 | Ryuichi Hirata | 35.3.13.6 | 144.35 | 11be D0.3 says an MLD shall wait for expiration of the largest number of backoff counters of STAs. This may cause long delay to start transmission of the PPDUs and may lead STA to loose its transmission opportunity. | Solve this issue. This could be solved by defining mechanism to improve transmission opportunity for start time sync such as same random backoff proposed in 11-20/0974r4. | Rejected.  The group discussed the issues described in CID 2712 and proposed solution discussed in 11-20/0974r4 and reached no consensus |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 1513 | Dmitry Akhmetov |  |  | 10.23.2.2. (EDCA backoff procedure) contain requirement to invoke EDCA procedure. Need to be updated to include SYNC access case |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

**TGbe Editor to make the following changes in Subclause 35.3.13.6:**

**35.3.13.6 Start time sync PPDUs medium access**

Each STA of an MLD operating on a pair of NSTR links for that MLD (#1797, 3323, 2142, 2434, 2718, 1772) that aligns the start times of PPDUs scheduled for transmission on more than one link shall ensure that the EDCA rules on each link permit access to the medium (#3141) on all the links at the time of issuance of the PHY-TXSTART.request for each link.

NOTE 1—The backoff counters for each link count down as specified in 10.23.2.4 (Obtaining an EDCA TXOP).

NOTE 2—Whether to extend this mechanism to STR MLD is TBD. (\*see below as a separate discussion)

A STA of an MLD operating on a link that is a part of an NSTR link pair for that MLD (#2435, 2718,1772) shall follow the channel access procedure described below:

* (1) The STA may initiate transmission on a link when the medium is idle as indicated by the physical and virtual CS mechanisms (#1510) and one of the following conditions is met:
* (a)The STA obtained an EDCA TXOP following procedure in 10.23.2.4 (Obtaining an EDCA TXOP (#1757)
* (b) The backoff counter of the STA is already zero, and the STA operating on the other link of NSTR link pair of the affiliated MLD obtained an EDCA TXOP following the procedure in 10.23.2.4 (Obtaining an EDCA TXOP) (#1757).
* (2) When the backoff counter of the STA reaches zero, it may choose to not transmit and keep its backoff counter at zero.
* (3) If the backoff counter of the STA has already reached zero, it may perform a new backoff procedure following deferral procedures as described in 10.23.2.4 and 10.3.4.3 (#1349, 1509) . CW[AC] and QSRC[AC] are left unchanged.

**TGbe Editor to insert the following Notes following P144L49 in Subclause 35.3.13.6:**

Note 1: A STA with backoff counter that has already reached zero and there is a frame available for transmission performs a new backoff procedure before being allowed to initiate transmission on a link following condition (a) (#3399)

~~Note 2: To initiate a new backoff procedure as in (3) for EDCAF with a backoff counter that already reached zero a STA obeys deferral procedures following the last medium transition to idle as described in 10.23.2.4 and 10.3.4.3. (#1439, 1509)~~

**TGbe Editor to insert the following paragraphs after Notes in Subclause 35.3.13.6:**

A STA that chooses not to transmit after the backoff counter reached zero on a link of NSTR link pair may have one or more EDCAF backoff counters with value zero on that link. The STA that initiates transmission on that link following condition (a) or (b), and has one or more EDCAF backoff counter that already reached zero shall choose only one implementation specific EDCAF for the transmission (#1501, 1502, 1512, 2211.2)

A STA with backoff counter that has already reached zero on a link and has a frame available for transmission shall follow channel access procedures described 10.23.2.4. (Obtaining an EDCA TXOP) after it detect medium transition from busy to idle. (#1511, 3205)

The STA with backoff counter that has already reached zero and is initiating transmission following condition (b) is not mandated to initiate transmission on a slot boundary of the link on which the STA operates (#2211.1, 2741). The STA that is initiating transmission following condition (b) shall commence the transmission no later than 4us ~~aSlotTime~~ following slot boundary of the link on which the other STA whose backoff counter reaches zero operates.

SP:

Do you support to accept the resolution for the following CIDs in 11/0514r8:

1439, 1501, 1502, 1509, 1510, 1511, 1512, 1514, 1757, 1772, 1797, 2211, 2142, 2434, 2435, 2718, 2740, 2741, 3141, 3142, 3143, 3145, 3205, 3323, 3399, 1507, 1703, 3398.

Postponed CIDs:

1513, 2712

**TBD resolution in CIDs 1507, 1703 and 3398**

“NOTE 2—Whether to extend this mechanism to STR MLD is TBD”.

Commenters requested contradictory resolutions – either extend sync PPDU start time to STR case as well or remove TBD and keep the mechanism limited to NSTR case only.

**Discussion**:

Proposed method for synchronous PPDU start time is not dependent on any specific NSTR characteristics or properties of an MLD. Any MLD operating on a pair of STR or NSTR links may use this mechanism to synchronize start of PPDUs on a pair of links.

While we in general there is little to no gain for an STR capable MLD to use sync PPDU start time for regular operation, there are cases areas when it is necessary. Example of such cases typically include communication with MLD with NSTR constraints on a pair of links:

* Non-AP MLD without NSTR constraints initiating transmission to NSTR softAP MLD. Non-AP MDL may occupy secondary link *only* along with the primary link. The only way for the non-AP MLD to occupy both channels is to perform sync start PPDU on both links

**Resolution**:

Remove “Note 2”. Remove “NSTR” qualifier, add “non-AP” qualifier where necessary to address case of communication with NSTR softAP MLD. As suchase modify “STA of an MLD” with “STA of non-AP MLD”.

**Possible text if resolutions for all CIDs accepted:**

Each STA of a non-AP (#1507, 1703, 3398) MLD operating on a pair of ~~NSTR~~ (#1507, 1703, 3398) links for that non-AP (#1507, 1703, 3398) MLD (#1797, 3323, 2142, 2434, 2718, 1772) that aligns the start times of PPDUs scheduled for transmission on more than one link shall ensure that the EDCA rules on each link permits access to the medium (#3141) on all the links at the time of issuance of the PHY-TXSTART.request for each link.

NOTE 1—The backoff counters for each link count down as specified in 10.23.2.4 (Obtaining an EDCA TXOP).

~~NOTE 2—Whether to extend this mechanism to STR MLD is TBD.~~ (#1507, 1703, 3398)

A STA of a non-AP (#1507, 1703, 3398) MLD operating on a link that is a part of a~~n NSTR~~ (#1507, 1703, 3398) link pair for that non-AP (#1507, 1703, 3398) MLD (#2435, 2718,1772) shall follow the channel access procedure described below:

* (1) The STA may initiate transmission on a link when the medium is idle as indicated by the physical and virtual CS mechanisms (#1510) and one of the following conditions is met:
* (a)The STA obtained an EDCA TXOP following procedure in 10.23.2.4 (Obtaining an EDCA TXOP (#1757)
* (b) The backoff counter of the STA is already zero, and the STA operating on the other link of a ~~NSTR~~ (#1507, 1703, 3398) link pair of the affiliated non-AP (#1507, 1703, 3398) MLD obtained an EDCA TXOP following the procedure in 10.23.2.4 (Obtaining an EDCA TXOP) (#1757).
* (2) When the backoff counter of the STA reaches zero, it may choose to not transmit and keep its backoff counter at zero.
* (3) If the backoff counter of the STA has already reached zero, it may perform a new backoff procedure following deferral procedures as described in 10.23.2.4 and 10.3.4.3 (#1349, 1509) .  
  CW[AC] and QSRC[AC] are left unchanged.

**TGbe Editor to insert the following Notes following P144L49 in Subclause 35.3.13.6:**

Note 1: A STA with backoff counter that has already reached zero and there is a frame available for transmission performs a new backoff procedure before being allowed to initiate transmission on a link following condition (a) (#3399)

~~Note 2: To initiate a new backoff procedure as in (3) for EDCAF with a backoff counter that already reached zero a STA obeys deferral procedures following the last medium transition to idle as described in 10.23.2.4 and 10.3.4.3. (#1439, 1509)~~

**TGbe Editor to insert the following paragraphs after Notes in Subclause 35.3.13.6:**

A STA that chooses not to transmit after the backoff counter reached zero on a link of ~~NSTR~~ (#1507, 1703, 3398) link pair may have one or more EDCAF backoff counters with value zero on that link. The STA that initiates transmission on that link following condition (a) or (b), and has one or more EDCAF backoff counter that already reached zero shall choose only one implementation specific EDCAF for the transmission (#1501, 1502, 1512, 2211.2)

A STA with backoff counter that has already reached zero on a link and has a frame available for transmission shall follow channel access procedures described 10.23.2.4. (Obtaining an EDCA TXOP) after it detect medium transition from busy to idle. (#1511, 3205)

The STA with backoff counter that has already reached zero and is initiating transmission following condition (b) is not mandated to initiate transmission on a slot boundary of the link on which the STA operates (#2211.1, 2741). The STA that is initiating transmission following condition (b) shall commence the transmission no later than 4us ~~aSlotTime~~ following slot boundary of the link on which the other STA whose backoff counter reaches zero operates.