IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Proposed Draft Text  MAC MLO Enhanced Multi-link Single-Radio Operation | | | | |
| Date: 2020-8-20 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Minyoung Park | Intel Corporation |  |  | Minyoung.park@intel.com |
| Laurent Cariou | Intel Corporation |  |  | laurent.cariou@intel.com |
| Dibakar Das | Intel Corporation |  |  | Dibakar.Das@intel.com |
| Young Hoon Kwon | NXP |  |  | younghoon.kwon@nxp.com |
| Yongho Seok | Mediatek |  |  | Yongho.seok@mediatek.com |
| Liwen Chu | NXP |  |  | Liwen.chu@nxp.com |
| Sharan Naribole | Samsung |  |  | n.sharan@samsung.com |
| Yonggang Fang | ZTE |  |  | yfang@ztetx.com |
| Zhiqiang Han | ZTE |  |  | han.zhiqiang1@zte.com.cn |
| Liuming Lu | ZTE |  |  | lu.liuming@zte.com.cn |
| Sanghyun Kim | WILUS |  |  | shk0787@naver.com |
| Xiandong Dong | Xiaomi |  |  | dongxiandong@xiaomi.com |
| Ming Gan | Huawei |  |  | Ming.gan@huawei.com |
| Duncan Ho | Qualcomm |  |  | dho@qti.qualcomm.com |
| George Cherian | Qualcomm |  |  | gcherian@qti.qualcomm.com |

Abstract

This submission proposes draft text to be included in 802.11be Draft 0.1 for the following topic:

* MAC MLO Enhanced Multi-link Single-radio Operation
  + Based on the following motions: Motion 119 #SP125 and Motion 119 #SP126.
  + Single-link/radio (TBD) non-AP MLD: A non-AP MLD that supports operation on more than one link but can only receive, or transmit frames on one link at a time.

[Motion 119, #SP118, [3] and [179]]

[Motion 119, #SP125, [3] and [180]]

* + 802.11be supports the multi-link operation for a non-AP MLD that is defined as follows to be included in R1.
* A non-AP MLD that can: 1) transmit or receive data/management frames to another MLD on one link at a time, and 2) listening on one or more links.
  + The “listening” operation includes CCA as well as receiving initial control messages (e.g., RTS/MU-RTS).
  + The initial control message may have one or more additional limitations: spatial stream, MCS (data rate), PPDU type, frame type.
  + Link switch delay may be indicated by the non-AP MLD.

[Motion 119, #SP126, [3] and [181]]

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Updated based on the comments from Young Hoon Kwon. Added motion texts in the abstract.
* Rev 2: Updated based on the comments from Yongho, Young Hoon, Liwen, Sharan, Yonggang.
* Rev 3: Updated based on the comments from Sanghyun
* Rev 4: Updated based on the comments from Xiandong and Zhiqiang
* Rev 5: Updated based on the comments from Ming
* Rev 6: Updated based on the comment from George and Duncan (changes highlighted in green)
* Rev 7: Updated based on the comment from Sharan and Yongho(changes highlighted in green)
* Rev 8: Updated based on the comment from Liuming(changes highlighted in green)
* Rev 9: Updated based on the comment from Duncan (changes highlighted in green)

**3.2 Definitions specific to IEEE 802.11**

***TGbe editor: add the following definition to subclause 3.2 Definitions specific to IEEE 802.11 as follows:***

A single-link/radio (*TBD*) non-AP MLD is a non-AP MLD that supports operation on more than one link but receives or transmits frames only on one link at a time. (Motion 119, #SP125)

***TGbe editor: Insert the new subclause 33.x.y Enhanced multi-link single-radio operation as follows:***

**33.x.y Enhanced multi-link single-radio operation** (Motion 119, #SP126)

A non-AP MLD may operate in the enhanced multi-link single-radio (EMLSR) mode on a specified set of the enabled links between the non-AP MLD and its associated AP MLD. (*name of the mode is TBD*) The specified set of the enabled links in which the EMLSR mode is applied are called EMLSR links.

An MLD with dot11EHTEMLSROptionImplemented equal to true shall set the EMLSR mode subfield of the TBD Capabilities element, which is an MLD level capabilities element, to 1; otherwise, the MLD shall set the EMLSR mode subfield to 0.

When a non-AP MLD is operating in the EMLSR mode, the non-AP MLD shall be able to listen on the EMLSR links, by having its affiliated STA(s) corresponding to those links in the awake state. The listening operation includes CCA and receiving the initial Control frame of a frame exchange sequence that is initiated by an AP MLD.

The initial Control frame of a frame exchange sequence may have one or more limitations for the following parameters: the number of spatial streams, MCS(s) (or data rate(s) for non-HT PPDU), PPDU type(s), and frame type(s). The non-AP MLD may indicate its link switch delay in a TBD management frame.

Note – For example, the limitations of the initial Control frame can be as follows: one spatial stream, data rate less than or equal to 24 Mbps, non-HT PPDU, and RTS or MU-RTS frame.

The AP MLD shall initiate a frame exchange sequence with the non-AP MLD on one of the EMLSR links by transmitting an initial Control frame to the non-AP MLD with the limitations specified above.

After receiving the initial Control frame of a frame exchange sequence, the non-AP MLD shall transmit or receive frames on the link in which the initial Control frame was received and shall not transmit or receive on the other link(s) of the EMLSR links until the end of the frame exchange sequence, and subject to its spatial stream capabilities, operation mode, and link switch delay, the non-AP MLD shall be capable of receiving a PPDU that is sent using more than one spatial stream a SIFS after the end of its response frame transmission solicited by the initial Control frame. During the frame exchange sequence, the AP MLD shall not transmit frames to the non-AP MLD on the other link(s) of the EMLSR links. The non-AP MLD switches back to the listening operation on the EMLSR links immediately after the end of the frame exchange sequence.