IEEE P802.11
Wireless LANs

|  |
| --- |
| PDT: Channel access for Triggered TXOP Sharing  |
| Date: 2021-03-17 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Dibakar Das | Intel |  |  | Dibakar.das@intel.com |
| Laurent Cariou |  |  |  |
| Dmitry Akhmetov |  |  |  |
| Dan Bravo |  |  |  |
| Danny Alexander |  |  |  |

Abstract

This submission proposes channel access rules to the **Triggered TXOP sharing procedure** in 0087r6 and resolve the following TBD:

“After a non-AP STA receives an MU-RTS TXS Trigger frame from its associated AP and addressed to it, the STA shall transmit one or more non-TB PPDUs within the time allocation signaled in the TBD field of the MU-RTS TXS Trigger frame.”

**Discussion:**

1. We propose the signaling and the channel access procedure for the Triggered TXOP sharing procedure.
2. We propose that the time allocation information is carried in the UL Length field of the MU-RTS TX Trigger frame to signal upto ~16ms. However, there can be two options on the signaling format. As such we may want to run a SP.

 **SP 1**

 Which option do you support for the encoding in the UL Length field in an MU-RTS TX Trigger frame to indicate the time allocated to a non-AP STA:

 Option 1: Bits B0-B6 of the UL Length field are used and with unit of 128us

 Option 2: Bits B0-B11 of the UL Length field in units of 4us ?

This PDT assumes Option 1 is preferred.

**9.3.1.22 Trigger frame format**

**9.3.1.22.1 General**

***TGbe editor: Modify Figure 9-64b in P45L53 of 11ax draft 8.0 as follows:***

 **B0 B3 B4 B15 B16 B17 B18 B19 B20 B21 B22 B23 B25**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Trigger Type | UL Length | More TF | CS Required | UL BW | GI And HE-LTF Type/TXOP Sharing Modes | MU-MIMO HE-LTF Mode | Number of HE-LTF Symbols And Midamble Periodicity |

Bits: 4 12 1 1 2 2 1 3

 **B26 B27 B28 B33 B34 B35 B36 B37 B52 B53 B54 B62**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| UL STBC | LDPCExtraSymbolSegment | AP TxPower | Pre-FECPaddingFactor | PEDisambiguity | UL SpatialReuse | Doppler | ULHE-SIG-A2Reserved |

Bits: 4 12 1 1 2 2 1 3

 **B63**

|  |  |
| --- | --- |
| Reserved | Trigger Dependent Common Info |

 Bits: 1 variable

 **Figure 9-64b—Common Info field format**

***TGbe editor: Insert the following text in P128L48 of 11ax draft 8.0 as follows:***

If the Trigger Type subfield value is 3, then B20–B21 of the Common Info field is the TxOP Sharing Modes subfield, otherwise B20–B21 of the Common Info field is the GI And HE-LTF Type subfield.

**9.3.1.22.5 MU-RTS Trigger frame format**

***TGbe editor: Modify the following text in P129L43 of 11ax draft 8.0 as follows:***

The MU-MIMO HE-LTF Mode, Number Of HE-LTF Symbols And Midamble Periodicity, UL STBC, LDPC Extra Symbol Segment, AP Tx Power, Pre-FEC Padding Factor, PE Disambiguity, UL Spatial Reuse, Doppler and UL HE-SIG-A2 Reserved subfields in the Common Info field are reserved.

***TGbe editor: Modify the following text in P66L52 of draft 0.4 as follows:***

The TxOP Sharing Modes subfield in the Common Info field is set to a nonzero value to signal an MU-RTS Trigger frame from an EHT AP that allocates time within an obtained TXOP to an EHT non-APSTA for transmitting one or more non-TB PPDUs sequentially (see 35.2.1.3 (Triggered TXOP sharing procedure)). The TxOP Sharing Modes subfield encoding in an MU-RTS frame ~~sent from an EHT AP~~ is defined in Table 9-31xxx (TxOP Sharing Modes subfield encoding).

 **Table 9-31xxx TxOP Sharing Modes subfield encoding**

|  |  |
| --- | --- |
| **TxOP Sharing Modes subfield value** | **Description** |
| 0 | MU-RTS that does not initiate MU-RTS TXOP Sharing procedure  |
| 1 | MU-RTS that initiates MU-RTS TXOP Sharing procedure wherein a scheduled STA can only transmit UL PPDUs |
| 2 | MU-RTS that initiates MU-RTS TXOP Sharing procedure wherein a scheduled STA can transmit any PPDU(s) |
| 3  | Reserved |

An MU-RTS Trigger frame with the TxOP Sharing Modes subfield set to a nonzero value is called an MU-RTS TXOP Sharing (TXS) Trigger frame for the remainder of this subclause and Clause 35 (Extremely high throughput (EHT) MAC specification).

The UL Length subfield in the Common Info field of the MU-RTS TXS Trigger frame indicates the time duration allocated to the non-AP STA within the TXOP obtained by the AP. The bits B0-B6 of the UL Length subfield in the MU-RTS TXS Trigger frame contain the allocated time duration in units of 128µs; other bits are reserved.

The UL Length subfield is reserved in an MU-RTS Trigger frame that is not a MU-RTS TXS Trigger frame.

***TGbe editor: Insert the following text in P341L48 of 11ax draft 8.0 as follows:***

**26.2.4 Updating two NAVs**

An EHT STA that used information from an MU-RTS TXS Trigger frame as the most recent basis to

update its NAV shall not reset the NAV that is updated by this frame even if no PHYRXSTART.indication primitive is received from the PHY during a period with a duration of

2 × aSIFSTime + CTS\_Time + aRxPHYStartDelay + 2 × aSlotTime starting when the MAC receives a

PHY-RXEND.indication primitive corresponding to the detection of the MU-RTS TXS Trigger frame

(see 10.3.2.4 (Setting and resetting the NAV) for the definition of CTS\_Time).

***TGbe editor: Modify the following text in P66L52 of draft 0.4 as follows:***

**35.2.1.3 Triggered TXOP sharing procedure**

 **35.2.1.3.1 General**

The Triggered TXOP sharing procedure allows an AP to allocate a portion of the time within an obtained TXOP to a non-AP STA for transmitting one or more non-TB PPDUs.
A STA with dot11TXOPSharingTFOptionImplemented equals to true shall set the Triggered TXOP Sharing Support subfield in EHT Capabilities element to 1; otherwise, it shall set the subfield to 0.

An AP and non-AP STA shall follow the rules defined in 26.2.6 (MU-RTS Trigger/CTS frame exchange procedure) when transmitting and responding to a MU-RTS TXS Trigger frame respectively with the exceptions defined in 35.2.1.3.2 (AP behavior) and 35.2.1.3.3 (Non-AP STA behavior).

**35.2.1.3.2 AP behavior**

An AP may allocate time within an obtained TXOP to a non-AP STA by transmitting an MU-RTS TXS Trigger frame as defined in 9.3.1.22.5 (MU-RTS Trigger frame format) parametrized as follows:
— The Trigger frame has one User Info field that is addressed to the non-AP STA. A User Info field is addressed to a non-AP STA if the AID12 subfield of the User Info field is equal to the 12 LSBs of the AID of the STA and the Trigger frame is sent by the AP with which the non-AP STA is associated.

An AP shall not send a MU-RTS TXS Trigger frame to an associated non-AP STA from which it has not received an EHT Capabilities element with the Triggered TXOP Sharing Support subfield set to 1.

After transmitting an MU-RTS TXS Trigger frame that allocates time to a non-AP STA and receiving the corresponding CTS frame, an AP shall not transmit any PPDU within the time indicated in the Duration field of that CTS frame except under the following conditions:

* The AP received a frame from the non-AP STA that requires an immediate response.
* The AP transmitted an MU-RTS TXS Trigger frame with TxOP Sharing Modes subfield value set to 1 and the CS mechanism indicates that the medium is idle at the TxPIFS slot boundary.

An AP that transmitted an MU-RTS TXS Trigger frame and received the corresponding CTS frame shall sense the channel using Energy Detection defined in 27.3.20.6.5 (Per 20 MHz CCA sensitivity) within SIFS after the end of the time indicated in the Duration field of that CTS frame and reclaim the channel SIFS after the end of the time indicated in the Duration field of that CTS frame if it is determined to be idle. Otherwise, the AP shall sense the channel and reclaim it if the WM is determined to be idle at the TxPIFS slot boundary after the end of the medium busy condition.

NOTE—If an AP transmits an MU-RTS TX Trigger frame with TxOP Sharing Modes subfield value set to 1 and the CS mechanism indicates that the medium is idle at the TxPIFS slot boundary, then the AP might perform a PIFS recovery as described in 10.23.2.8 (Multiple frame transmission in an EDCA TXOP) or invoke the backoff procedure described in 10.23.2.2 (EDCA backoff procedure).

NOTE—Error recovery of the Triggered TXOP sharing mechanism is the responsibility of the AP when the TxOP Sharing Modes subfield value in the corresponding MU-RTS TXS Trigger frame is set to 1 and is the responsibility of the scheduled non-AP STA otherwise.

**35.2.1.3.3 Non-AP STA behavior**

After a non-AP STA receives an MU-RTS TXS Trigger frame from its associated AP and containing a User Info field that is addressed to it, the STA shall transmit one or more non-TB PPDUs within the time allocation signalled in the UL Length subfield of Common Info field of the MU-RTS TXS Trigger frame. The first PPDU of the exchange shall be a CTS frame transmitted per the rules defined in 26.2.6.3 (CTS frame response to an MU-RTS Trigger frame).

.

The time allocation starts after the end of transmission of the MU-RTS TXS Trigger frame.
During this allocated time, the non-AP STA may transmit non-TB PPDUs to its associated AP or another STA.
NOTE—For example, the other STA can be a peer STA of a peer-to-peer link.

A non-AP STA addressed by a User Info field in the MU-RTS TX Trigger frame (i.e., the AID12 subfield is equal to the 12 LSBs of the AID of the non-AP STA) shall ensure that its PPDU transmission(s) and any expected responses fit entirely within the time signaled in the Duration field of the CTS frame except that:

* The non-AP STA may exceed the allocated time if it satisfies any of the conditions described in 10.23.2.9 (TXOP limits) that allows a TXOP holder STA to exceed the TXOP limit.