IEEE P802.11
Wireless LANs

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| Proposed Draft Text: Nominal Packet Padding Values Selection Rules |
| Date: 2021-03-xx |
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Abstract

This submission provides the proposed draft text for **35.xx Nominal Packet Padding Values Selection Rules** for 802.11be D0.4. The revised contents in this draft indicate the changes compared with the text in 26.12 HE PPDU post-FEC padding and packet extension in 11ax.

The following Motion and SPs are related to this PDT:

[Motion146]

802.11be agrees to define PPE Thresholds field in EHT Capabilities element.

The existence of the PPE Thresholds field is indicated by the PPE Thresholds Present subfield in the EHT PHY Capabilities Information field.

[SP394 in 21/208r2]

Do you agree that EHT PPE Thresholds field is defined similarly as 11ax with the following subfields?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | NSS | RU Index Bitmask | PPE Thresholds Info | PPE Pad |
| Bits | 4 | 5 | variable | 0 to 7 |

[SP395 in 21/208r2]

Do you agree with the following table of RU allocation index in EHT PPE Thresholds field?

|  |  |
| --- | --- |
| RU allocation index | RU allocation size |
| 0 | 242 |
| 1 | 484 |
| 2 | 484+242, 996 |
| 3 | 996+484, 996+484+242, 2×996  |
| 4 | 2×996+484, 3×9963×996+484, 4×996 |

[SP396 in 21/208r2]

Do you agree that the following nominal packet padding value is used when the number of spatial streams (NSS) used for transmission is larger than the NSS value indicated in the NSS subfield?

* 16 μs for any RU/Constellation when the NSS used for transmission <=8
* 20 μs for any RU/Constellation when the NSS used for transmission >8 for R2

[SP397 in 21/208r2]

Do you agree with the following meanings of the Zeros in the Bitmask sequence in RU Index Bitmask subfield?

* For zeros before the first the 1
* Nominal packet padding value = 0 μs
* For zeros after the first 1
* The corresponding constellation index for the missing RU (Bitmask value = 0) shall be the same as the closest smaller RU with PPET defined (Bitmask value = 1)

[SP398 in 21/225r2]

Do you agree that EHT PPE Threshold Info field includes two PPET elements for each case with 1<=NSS<=NSS+1 and RU with value 1 in the RU Index Bitmask:

* PPET8 indicates QAM threshold for nominal packet padding of 8us
* PPETx indicates QAM threshold for next higher nominal packet padding:
* 16us for RU<=996\*2 and Nss<=8 and QAM<=1024
* 20us for other modes

[SP399 in 21/0225r2]

Do you agree to EHT “PPE Thresholds Present” is defined as follows?

* 1: EHT PPET field is present
* 0: EHT PPET field is not present
* PHY Capability field of EHT Common Nominal Packet Padding is specified.
* If HE “PPE Thresholds Present”=1,
* EHT nominal packet padding is the same for all modes covered in HE PPET
* For Nss = 1:NSTS+1 and RU/MRU within the Bitmap range [242, 484, 996, 996x2], all rules of HE PPET parsing for NSTS and RU Index Bitmap apply.
* EHT nominal packet padding for 484+242 follows HE PPETs for RU996.
* EHT nominal packet padding for MRU 996+484, 996+484+242 follows HE PPETs for RU996\*2.
* For nominal packet padding not covered in HE PPET, use the values indicated in EHT Common Nominal Packet Padding, i.e. RU > 996x2 or Nss>8 or 4K-QAM.
* EHT Common Nominal Packet Padding shall be larger than or equal to the larger normal packet padding values among all modes covered in HE PPET.
* If HE “PPE Thresholds Present”=0, EHT nominal packet padding follows the values indicated in EHT Common Nominal Packet Padding for all EHT PPDUs.
* EHT Common Nominal Packet Padding shall not be smaller than HE Nominal Packet Padding.

 [SP400 in 21/0225r2]

Do you agree that the EHT Constellation Index table is defined the same as HE Constellation Index table except that value 6 is redefined as 4096-QAM?

**Version history:**

Rev 0: Initial PDT

35.xx Nominal packet padding values selection rules

An EHT STA with dot11EHTPPEThresholdsRequired set to false may set the PPE Thresholds Present subfield in the EHT Capabilities elements that it transmits to 0.

An EHT STA with dot11EHTPPEThresholdsRequired set to true shall set the PPE Thresholds Present subfield in the EHT Capabilities elements that it transmits to 1.

An EHT STA that sets the PPE Thresholds Present subfield to 0 in both the EHT and HE Capabilities elements, and the Common Nominal Packet Padding subfield to 0 in the EHT Capabilities elements that it transmits has a nominal packet padding of 0 µs for all constellations, NSS and RU allocations that it supports.

An EHT STA that sets the PPE Thresholds Present subfield to 0 in both the EHT and HE Capabilities elements, and the Common Nominal Packet Padding subfield to 1 in the EHT Capabilities elements that it transmits has a nominal packet padding of 8 µs for all constellations, NSS and RU allocations that it supports.

An EHT STA that sets the PPE Thresholds Present subfield to 0 in both the EHT and HE Capabilities elements, and the Common Nominal Packet Padding subfield to 2 in the EHT Capabilities elements that it transmits has a nominal packet padding of 16 µs for all constellations, NSS and RU allocations that it supports.

An EHT STA that sets the PPE Thresholds Present subfield to 0 in both the EHT and HE Capabilities elements, and the Common Nominal Packet Padding subfield to 3 in the EHT Capabilities elements that it transmits has a nominal packet padding of 16 µs for all modes with constellation order up to 1024-QAM, less than or equal to 8, and RU or MRU size less than or equal to 2x996, and a nominal packet padding of 20 µs for all other modes the STA supports.

An EHT STA that sets the PPE Thresholds Present subfield to 0 in the EHT Capabilities elements, and sets it to 1 in the HE Capabilities elements that it transmits has the same nominal packet padding for the EHT transmission as in the HE transmission for all modes covered in the PPE Thresholds field in the HE Capabilities elements. These modes are indicated by the NSTS subfield (0 to the *NSTS* indicated in the NSTS subfield) and the RU Index Bitmask subfield ([242, 484, 996, 2×996]) in the HE Capabilities elements. The nominal packet padding values for 484+242-tone MRU are the same as for 996-tone RU indicated in the PPE Thresholds field in the HE Capabilities elements. The nominal packet padding values for 996+484-tone MRU and 996+484+242-tone MRU are the same as for 2×996-tone RU indicated in the PPE Thresholds field in the HE Capabilities elements. The nominal packet padding for all the other modes not indicated by the PPE Thresholds field in the HE Capabilities elements shall follow the rules indicated by the Common Nominal Packet Padding subfield in the EHT Capabilities elements. The nominal packet padding indicated by the Common Nominal Packet Padding subfield in the EHT Capabilities elements shall be greater than or equal to the largest nominal packet padding values among all the modes indicated in the PPE Thresholds field in the HE Capabilities elements. [#S399]

An EHT STA that sets the PPE Thresholds Present subfield to 1 in the EHT Capabilities elements that it transmits shall indicate its nominal packet padding per constellation, NSS and RU allocation by setting the subfields of the EHT PPE Thresholds field according to 9.4.2.295c (EHT Capabilities element) and using the corresponding values from dot11EHTPPEThresholdsMappingsTable. The nominal packet padding values for an EHT STA that sets the PPE Thresholds Present subfield to 1 in the EHT Capabilities elements that it transmits are only determined by the EHT PPE Thresholds field. [#S399]After receiving the EHT PPE Thresholds field from a second STA, the first STA uses the combination of the PPETx NSS*n* RU*b* subfield and PPET8 NSS*n* RU*b* subfield values to determine the nominal packet padding for EHT PPDUs that are transmitted to the second STA using NSS = *n* and an RU allocation corresponding to RU Allocation Index *b*, for each value of NSS and RU specified by the field. The nominal packet padding is used in computing the PE field duration (see 36.3.13 (Packet extension)). [#S398]

NOTE—If the pre-FEC padding factor is 4, then the value of nominal *TPE* is equal to the nominal packet padding (see Table 36-49 (Nominal T*PE* values)).

The nominal packet padding as a function of the PPE thresholds, the number of spatial streams and the RU allocation index is described in Table 35-xx (PPE thresholds per PPET8 and PPETx).

|  |
| --- |
| Table 35-xx―PPE thresholds per PPET8 and PPETx [#396, #397, #398, #399] |
| Result of comparison of the constellation index *c* of an EHT PPDU with NSS value *n* and RU allocation size that corresponds to the RU allocation index = (*b* + DCM) to the PPET8 NSS*n* RU(*b* + DCM) value | Result of comparison of the constellation index *c* of an EHT PPDU with NSS value *n* and RU allocation size that corresponds to the RU allocation index = value (*b* + DCM) to the PPETx NSS*n* RU(*b* + DCM) value | Nominal packet padding for an EHT PPDU transmitted to this STA using the constellation index = *c*, NSS = *n* and RU allocation size that corresponds to the RU allocation index = (*b* + DCM) |
| *c* greater than or equal to PPET8 | *c* less than PPETx or PPETx equal to None | 8 µs |
| *c* greater than PPET8 or PPET8 equal to None | *c* greater than or equal to PPETx | 16 µs if *c* ≤ 5 and (*b* + DCM) ≤ 3 and *n* ≤ 8 |
| 20 µs if c=6, or (*b* + DCM) = 4 or n>8 |
| All other cases with PPET8 and PPETx values defined | 0 µs |
| NOTE 1—DCM = 1 if the EHT PPDU uses EHT-MCS14 or EHT-MCS15; DCM = 0 otherwise.NOTE 2—If there exists one or more 0s before the first 1 in the bitmask sequence in the RU Index Bitmask subfield, the nominal packet padding is 0 µs for each RU allocation index corresponding to these 0s.NOTE 3—If there exists one or more 0s after the first 1 in the bitmask sequence in the RU Index Bitmask subfield, the PPETx and PPET8 values for each RU allocation index corresponding to these 0s shall be the same as the PPETx and PPET8 values for the closest smaller RU allocation index with the bitmask value equal to 1 in the RU Bitmask Index subfield.NOTE 4—The nominal packet padding value is 16 µs for all supported RU/MRU sizes and constellations if the number of spatial streams of the EHT PPDU transmission is greater than (*NSS* + 1) and less than or equal to 8, where *NSS* is the value in the NSS subfield” |

In Table 35-xx (PPE thresholds per PPETx and PPET8), "RU Allocation index = (*b* + DCM)" means the following. With the exception of an RU or MRU indicated by the RU allocation index equal to 4, if DCM is applied in a given RU, the nominal packet padding value is based on the next larger RU allocation index (RU allocation index + 1). For example, if DCM is applied to a 242-tone RU then the nominal packet padding value for a 484-tone RU is used. If DCM is applied to 106-tone RU then the nominal packet padding value for a 242-tone RU is used. If DCM is applied to an RU or MRU indicated by the RU allocation index equal to 4, then the nominal packet padding value for the same RU or MRU is used.

The nominal packet padding value shall be 0 for all RU or MRU with size less than 242 unless the RU size is 106 or MRU size is 132 and DCM is enabled.

The PPETx and PPET8 subfields for RU allocation index *k* are present in the PPE Thresholds Info field only if bit *k* of the RU Index Bitmask subfield (bit 4 + *k* of the EHT PPE Thresholds field) is 1. When there exists one or more 0s before the first 1 in the bitmask sequence in the RU Index Bitmask subfield, the PPETx and PPET8 subfields for each RU allocation index corresponding to these 0s are not present, and the nominal packet padding value is 0 µs for these RU/MRUs. For example, if the bitmask sequence of RU Bitmask Index subfield is [0 0 1 1 1], the nominal packet padding value is 0 µs for the 242-tone RU and 484-tone RU. [#397]

When there exists one or more 0s after the first 1 in the bitmask sequence in the RU Index Bitmask subfield, the PPETx and PPET8 subfields for each RU allocation index corresponding to these 0s are not present, but the PPETx and PPET8 values are present, and the values shall be the same as the PPETx and PPET8 values for the closest smaller RU allocation index with the bitmask value equal to 1 in the RU Bitmask Index subfield. For example, if the bitmask sequence of RU Bitmask Index subfield is [1 0 0 1 1], the PPETx and PPET8 values for 484-tone RU, 484+242-tone MRU and 996-tone RU are the same as for the 242-tone RU. [#397]

The PPETx and PPET8 subfields for NSS value *n* are present only if *n* is less than or equal to (*NSS* + 1), where *NSS* is the value in the NSS subfield in EHT PPE Thresholds field of EHT Capabilities element. When the number of spatial streams of the EHT PPDU transmission is greater than (*NSS* + 1) and less than or equal to 8, the nominal packet padding value is 16 µs for all supported RU/MRU sizes and constellations. [#396]

A STA transmitting an EHT PPDU provides the nominal packet padding in the TXVECTOR parameter NOMINAL\_PACKET\_PADDING for the minimal PE calculation (see 36.3.13 (Packet extension)).

A STA transmitting an EHT PPDU that carries a broadcast frame shall set the value of the TXVECTOR parameter NOMINAL\_PACKET\_PADDING to 20 µs if at least one RU/MRU is modulated with 4096-QAM, or one RU/MRU is greater than 2×996, or more than eight spatial streams are transmitted on at least one RU/MRU, and set the value of the TXVECTOR parameter NOMINAL\_PACKET\_PADDING to 16 µs for all other modes. A STA transmitting an EHT PPDU that carries a group addressed, but not broadcast, frame shall not set the value of the TXVECTOR parameter NOMINAL\_PACKET\_PADDING to a value that is less than that required for any of the recipients in the group.

A STA transmitting an EHT PPDU to a receiving STA shall include post-FEC padding determined by the pre-FEC padding factor (see 36.3.12 (Data field)) and after including the post-FEC padding, the transmitting STA shall include a packet extension with a duration indicated by the TXVECTOR parameter NOMINAL\_PACKET\_PADDING (see 36.3.13 (Packet extension)).

**Annex C**

***Add the following in the Dot11StationConfigEntry:***

Dot11EHTStationConfigEntry ::=

 SEQUENCE {

 …

 dot11EHTPPEThresholdsRequired TruthValue,

 … }

***Add the following after the Dot11StationConfigEntry:***

dot11EHTPPEThresholdsRequired OBJECT-TYPE

 SYNTAX TruthValue

 MAX-ACCESS read-only

 STATUS current

 DESCRIPTION

 "This is a capability variable.

 Its value is determined by device capabilities.

 This attribute, when true, indicates that PPE thresholds exist and are provided in dot11EHTPPEThresholdsTable."

 DEFVAL { false }

 ::= { dot11EHTStationConfigEntry <ANA> }

***Add the following in the dot11EHTComplianceGroup object:***

dot11EHTComplianceGroup OBJECT-GROUP

 OBJECTS {

 …

 dot11EHTPPEThresholdsRequired,

… }

 STATUS current

 DESCRIPTION

 "Attributes that configure the EHT Group for IEEE 802.11."

::= { dot11Groups <ANA> }

***Description of dot11EHTPPEThresholdsMappings Table:***

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-- \* dot11EHTPPEThresholdsMappings TABLE

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

dot11EHTPPEThresholdsMappingsTable OBJECT-TYPE

 SYNTAX SEQUENCE OF Dot11EHTPPEThresholdsMappingsEntry

 MAX-ACCESS not-accessible

 STATUS current

 DESCRIPTION

 "A conceptual table for EHT PPE thresholds mappings, which determines the nominal packet padding value as a function of the two PPE thresholds, PPET8 and PPETx, for an EHT PPDU of a particular RU allocation size and NSS value. The MIB supports the ability to share separate PPE thresholds for each NSS/RU pair. The thresholds mappings table contains one entry for each NSS/RU pair and contains two fields for each entry: PPET8 and PPETx."

 REFERENCE "IEEE Std 802.11-<year>, 35.xx (Nominal packet padding values selection rules)"

::= { dot11smt <ANA>}

dot11EHTPPEThresholdsMappingsEntry OBJECT-TYPE

 SYNTAX Dot11EHTPPEThresholdsMappingsEntry

 MAX-ACCESS not-accessible

 STATUS current

 DESCRIPTION

 "An Entry (conceptual row) in the EHT PPE Thresholds Mappings Table.

 ifIndex - Each IEEE Std 802.11 interface is represented by an ifEntry.

 Interface tables in this MIB module are indexed by ifIndex."

 INDEX { ifIndex, dot11EHTPPEThresholdsMappingIndex }

::= { dot11EHTPPEThresholdsMappingsTable 1 }

Dot11EHTPPEThresholdsMappingsEntry ::= SEQUENCE {

 dot11EHTPPEThresholdsMappingIndex Unsigned32,

 dot11EHTPPEThresholdsMappingNSS Unsigned32,

 dot11EHTPPEThresholdsMappingRUIndex Unsigned32,

 dot11EHTPPEThresholdsMappingPPET8 INTEGER,

 dot11EHTPPEThresholdsMappingPPETx INTEGER,

 dot11EHTPPEThresholdsMappingStatus RowStatus}

dot11EHTPPEThresholdsMappingIndex OBJECT-TYPE

 SYNTAX Unsigned32

 MAX-ACCESS not-accessible

 STATUS current

 DESCRIPTION

 "The auxiliary variable used to identify instances of the columnar objects in the EHT PPE Thresholds Mappings Table."

::= { dot11EHTPPEThresholdsMappingsEntry 1 }

dot11EHTPPEThresholdsMappingNSS OBJECT-TYPE

 SYNTAX Unsigned32

 MAX-ACCESS read-create

 STATUS current

 DESCRIPTION

 "The NSS value portion of the NSS/RU pair for which the values from this Thresholds mapping entry are to be used."

::= { dot11EHTPPEThresholdsMappingsEntry 2 }

dot11EHTPPEThresholdsMappingRUIndex OBJECT-TYPE

 SYNTAX Unsigned32

 MAX-ACCESS read-create

 STATUS current

 DESCRIPTION

 "The index of the RU value portion of the NSS/RU pair for which the values from this thresholds mapping entry are to be used. The index values map to an RU as follows: RU Index of 0 is 242 tones, 1 is 448 tones, 2 is 484+242/996 tones, 3 is 996+484/996+484+242/2x996 tones, 4 is 2x996+484/3x996/3x996+484/4x996."

::= { dot11EHTPPEThresholdsMappingsEntry 3 }

dot11EHTPPEThresholdsMappingPPET8 OBJECT-TYPE

 SYNTAX INTEGER{BPSK(0), QPSK(1), 16-QAM(2), 64-QAM(3), 256-QAM(4), 1024-QAM(5), 4096-QAM(6), NONE(7)}

 MAX-ACCESS read-create

 STATUS current

 DESCRIPTION

 "An index that determines a constellation value at or above which a nominal packet padding value of at least 8 microseconds is required for the given NSS/RU pair corresponding to the row of the entry."

::= { dot11EHTPPEThresholdsMappingsEntry 4 }

dot11EHTPPEThresholdsMappingPPETx OBJECT-TYPE

 SYNTAX INTEGER{BPSK(0), QPSK(1), 16-QAM(2), 64-QAM(3), 256-QAM(4), 1024-QAM(5), 4096-QAM(6), NONE(7)}

 MAX-ACCESS read-create

 STATUS current

 DESCRIPTION

 "An index that determines a constellation value at or above which a nominal packet padding value of 16 microseconds or 20 microseconds is required for the given NSS/RU pair corresponding to the row of the entry."

::= { dot11EHTPPEThresholdsMappingsEntry 5 }

dot11EHTPPEThresholdsMappingStatus OBJECT-TYPE

 SYNTAX RowStatus

 MAX-ACCESS read-create

 STATUS current

 DESCRIPTION

 "The status column used for creating, modifying, and deleting instances of the columnar objects in the EHT PPE thresholds mapping table."

 DEFVAL { active }

::= { dot11EHTPPEThresholdsMappingsEntry 6 }

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-- \* End of dot11EHTPPEThresholdsMappings TABLE

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*