IEEE P802.11
Wireless LANs

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| Proposed Draft Text: Nominal Packet Padding Values Selection Rules Update |
| Date: 2021-04-xx |
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Abstract

This submission provides the revised text of 35.11 Nominal Packet Padding Values Selection Rules for 802.11be D0.5. The revised contents in this draft indicate the changes compared with the text in D0.4. The following changes are made in this submission:

1. Add the SP410 in 21/0392r2 to the text.
2. Set DCM to 0 for the case RU allocation index *b* = 3 (RU/MRU size = 996+484, 996+484+242, 2×996) if EHT-MCS14 or EHT-MCS 15 is used (Follow 11ax style).
3. Add more details for the case that an EHT STA sets the PPE Thresholds Present subfield to 0 in the EHT Capabilities element and sets it to 1 in the HE Capabilities element.
4. **Add table X1**: EHT nominal packet padding indication when the PPE Thresholds Present subfield is set to 0 in both the EHT and HE Capabilities elements
5. **Add table X2**: EHT nominal packet padding inheritance rule for ≤ NSTS+1 and RU/MRU ≤ 2×996, when the PPE Thresholds Present subfield is set to 0 in the EHT Capabilities element and 1 in the HE Capabilities element

The following SP are related to the revision:

[SP410 in 21/0392r2]

Do you support that for 4K QAM over small RU

* Propose to use RU242 nominal packet padding if “EHT PPE Thresholds present = 1”
* Use EHT Common Nominal Packet Padding if “EHT PPE Thresholds present = 0”

**Version history:**

Rev 0: Initial PDT

35.11 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 element that it transmits to 0.

An EHT STA with dot11EHTPPEThresholdsRequired set to true shall set the PPE Thresholds Present subfield in the EHT Capabilities element 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 element that it transmits has a nominal packet padding of 0 µs for all constellations, NSS and large size 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 element that it transmits has a nominal packet padding of 8 µs for all constellations, NSS and large size 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 element that it transmits has a nominal packet padding of 16 µs for all constellations, NSS and large size 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 element 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 large size RU or MRU size less than or equal to 2×996, and a nominal packet padding of 20 µs for all the other modes the STA supports except the modes with a small size RU or MRU.

An EHT STA that sets the PPE Thresholds Present subfield to 0 in both the EHT and HE Capabilities elements has a nominal packet padding of 0 µs for a small size RU or MRU, if 4096-QAM is not used for the RU or MRU, or if the RU size is 106 or the MRU size is 106+26 and EHT-MCS 15 is not applied to the RU or MRU. An EHT STA that sets the PPE Thresholds Present subfield to 0 in both the EHT and HE Capabilities elements has a nominal packet padding value indicated by the Common Nominal Packet Padding subfield in the EHT Capabilities element for a small size RU or MRU, if 4096-QAM is used for the RU or MRU, or if the RU size is 106 or the MRU size is 106+26 and EHT-MCS 15 is applied to the RU or MRU.

The rule to select the EHT nominal packet padding value, in the case of the PPE Thresholds Present subfield set to 0 in both the EHT and HE Capabilities elements, is described in Table X1 (EHT nominal packet padding indication when the PPE Thresholds Present subfield is set to 0 in both the EHT and HE Capabilities elements).

**Table X1: EHT nominal packet padding indication when the PPE Thresholds Present subfield is set to 0 in both the EHT and HE Capabilities elements**

|  |  |  |
| --- | --- | --- |
| EHT-MCS | Small size RU/MRU < 242 | Large size RU/MRU ≥ 242 |
| RU/MRU < 106 | 106-tone RU and 106+26-tone MRU |
| 0 to 11 | 0 us | 0 us | Common Nominal Packet Padding |
| 12 and 13 | Common Nominal Packet Padding | Common Nominal Packet Padding | Common Nominal Packet Padding |
| 14 | - | - | Common Nominal Packet Padding |
| 15 | 0 us | Common Nominal Packet Padding | Common Nominal Packet Padding |

An EHT STA that sets the PPE Thresholds Present subfield to 0 in the EHT Capabilities element, and sets it to 1 in the HE Capabilities element that it transmits, indicates that the nominal packet padding requirement for an EHT transmission of NSS*n*, RU*b* and constellation index less than 6, is the same as for the corresponding HE transmission if the modes are covered in the PPE Thresholds field in the HE Capabilities element. These modes consist of indicated by the NSTS subfield (0 to the *NSTS* indicated in the NSTS subfield) and the RU sizes indicated by the RU Index Bitmask subfield ([242, 484, 996, 2×996]) in the HE Capabilities element, including the modes with an RU corresponding to 0 in the RU Index Bitmask subfield in the HE Capabilities element. The nominal packet padding for EHT-MCS 14 or 15 for a large size RU of size 2×996 or smaller, is the same as that for HE MCS 0 with DCM = 1 for the same RU size. The nominal packet padding is 0 µs for a small size RU or MRU, except for the following cases: 4096-QAM is used for the RU or MRU, or EHT-MCS 15 is used for an RU of size 106 or MRU of size 106+26. The nominal packet padding for EHT-MCS 15 for an RU of size 106 or MRU of size 106+26, is the same as that of HE MCS 0 with DCM = 1 for RU size 106. The nominal packet padding for the following modes shall follow the rules indicated by the Common Nominal Packet Padding subfield in the EHT Capabilities element:

* For all modes with  greater than (*NSTS* + 1), the corresponding nominal packet padding shall follow the rules indicated by the Common Nominal Packet Padding subfield.
* For all modes with RU size greater than 2×996, the corresponding nominal packet padding shall follow the rules indicated by the Common Nominal Packet Padding subfield.
* For all modes with 4096-QAM, the corresponding nominal packet padding shall follow the rules indicated by the Common Nominal Packet Padding subfield.

The nominal packet padding values for 484+242-tone MRU are the same as for 996-tone RU derived above, and 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 derived above, in the case of the PPE Thresholds Present subfield set to 0 in the EHT Capabilities element and 1 in the HE Capabilities element. The nominal packet padding indicated by the Common Nominal Packet Padding subfield in the EHT Capabilities element 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 element.

The inheritance rule to select the EHT nominal packet padding value for ≤ NSTS+1 and RU/MRU ≤ 2×996, in the case of the PPE Thresholds Present subfield set to 0 in the EHT Capabilities element and 1 in the HE Capabilities element, is described in Table X2 (EHT nominal packet padding inheritance rule for ≤ NSTS+1 and RU/MRU ≤ 2×996, when the PPE Thresholds Present subfield is set to 0 in the EHT Capabilities element and 1 in the HE Capabilities element).

**Table X2: EHT nominal packet padding inheritance rule for** **≤ NSTS+1 and RU/MRU ≤** **2×996, when the PPE Thresholds Present subfield is set to 0 in the EHT Capabilities element and 1 in the HE Capabilities element**

|  |  |  |
| --- | --- | --- |
| EHT-MCS | Small size RU/MRU < 242 | 242 ≤ Large size RU/MRU ≤ 2×996 |
| RU/MRU < 106 | 106-tone RU and 106+26-tone MRU |
| 0 to 11 | HE nominal packet padding value (= 0 μs) | HE nominal packet padding value (= 0 μs) | HE nominal packet padding value |
| 12 and 13 | Common Nominal Packet Padding | Common Nominal Packet Padding | Common Nominal Packet Padding |
| 14 | - | - | HE nominal packet padding value for HE-MCS 0 + DCM |
| 15 | HE nominal packet padding value for HE-MCS 0 + DCM (= 0 μs) | HE nominal packet padding value for HE-MCS 0 + DCM | HE nominal packet padding value for HE-MCS 0 + DCM |

An EHT STA that sets the PPE Thresholds Present subfield to 1 in the EHT Capabilities element 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 element that it transmits are only determined by the EHT PPE Thresholds field.

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 36.3.14 (Packet extension)).

NOTE—If the pre-FEC padding factor is 4, then the value of nominal *TPE* is equal to the nominal packet padding (see Table 36-59 (Nominal TPE 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 35-2 (PPE thresholds per PPET8 and PPETx).

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| Table 35-2―PPE thresholds per PPET8 and PPETx  |
| 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 *b* is less than 3 and EHT-MCS14 or EHT-MCS15 is used; 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 Index Bitmask 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 35-2 (PPE thresholds per PPET8 and PPETx), “RU Allocation index = (*b* + DCM)” means the following. With the exception of an RU or MRU indicated by the RU allocation index equal to 3 or 4, if EHT-MCS 14 or EHT-MCS 15 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 EHT-MCS 15 is applied to a 242-tone RU then the nominal packet padding value for a 484-tone RU is used. If EHT-MCS 15 is applied to a 106- tone RU or a 106+26-tone MRU then the nominal packet padding value for a 242-tone RU is used. If EHT-MCS 14 or EHT-MCS 15 is applied to an RU or MRU indicated by the RU allocation index equal to 3 or 4, then the nominal packet padding value for the same RU or MRU is used. If DCM is considered, the RU allocation indices (*b* + DCM) for the 80 MHz, 160 MHz, and 320 MHz PPDUs using EHT-MCS 14 are equal to 3, 3, and 4, respectively.

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 RUs/MRUs. For example, if the bitmask sequence of RU Index Bitmask subfield is [0 0 1 1 1], the nominal packet padding value is 0 µs for the 242-tone RU and 484-tone RU.

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 Index Bitmask subfield. For example, if the bitmask sequence of RU Index Bitmask 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.

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.

An EHT STA that sets the PPE Thresholds Present subfield to 1 in the EHT Capabilities element has a nominal packet padding of 0 µs for a small size RU or MRU, if 4096-QAM is not used for the RU or MRU, or if the RU size is 106 or the MRU size is 106+26 and EHT-MCS 15 is not applied to the RU or MRU. An EHT STA that sets the PPE Thresholds Present subfield to 1 in the EHT Capabilities element has a nominal packet padding value the same as the value for the 242-tone RU, if 4096-QAM is used for the RU or MRU, or if the RU size is 106 or the MRU size is 106+26 and EHT-MCS 15 is applied to the RU or MRU.A STA transmitting an EHT PPDU provides the nominal packet padding in the TXVECTOR parameter NOMINAL\_PACKET\_PADDING for the minimal PE calculation (see 36.3.14 (Packet extension)).

The nominal packet padding value for a broadcast RU contained in an EHT PPDU that a STA transmits shall be set to 20 µs if the RU/MRU is modulated with 4096-QAM, or the RU/MRU is greater than 2×996, or more than eight spatial streams are transmitted on the RU/MRU, and shall be set to 16 µs for all other modes. A STA transmitting an EHT PPDU that carries a 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 and the broadcast RU. 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 36.3.13 (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 36.3.14 (Packet extension)).