### IEEE P802.11Wireless LANs

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| 11ax D2.2 MAC Comment Resolution for NAV Part III |
| Date: 2018-02-xx |
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Abstract

This submission proposes resolutions for comments of TGax Draft 2.2 with the following CIDs:

11073, 11475, 11489, 11793, 11797, 12088, 12177, 12572, 13007, 14102, 14103, 14104, 14236, 14262, 13300, 13059, 13058, 11075, 14328, 11503, 11516, 13035

Revisions:

* Rev 0: Initial version of the document.

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGax D2.2 Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGax D2.2 Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGax Editor: Editing instructions preceded by “TGax Editor” are instructions to the TGax editor to modify existing material in the TGax draft. As a result of adopting the changes, the TGax editor will execute the instructions rather than copy them to the TGax Draft.***

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| **CID** | **Commenter** | **P.L** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| 11073 | Adrian Stephens | 223.33 | 27.2.4 | "so that the NAV set by an inter-BSS PPDU can be considered the UL MU CS mechanism" -- deeply weird. Who is doing the considering? Either it is the mechanism or it is not. | Replace it with something that makes sense. | Revised – Agree in principle with the commenter. The intention is to describe that virtual CS can indicate busy due to the NAV set by the inter-BSS frame during UL MU CS. We have revised sentence to make it clear. TGax editor to make the changes shown in 11-18/0353r0 under all headings that include CID 11073. |
| 13058 | Osama Aboulmagd | 223.34 | 27.2.3 | Example give in the second paragraph on page 223 is not cleat, especially the last sentence. What does it mean "NAV set by an inter-BSS can be considered UL MU CS"? What is the relationship? | As is comment | Revised – Agree in principle with the commenter. The intention is to describe that virtual CS can indicate busy due to the NAV set by the inter-BSS frame during UL MU CS. We have revised sentence to make it clear. TGax editor to make the changes shown in 11-18/0353r0 under all headings that include CID 11073. |
| 11475 | Carol Ansley | 223.40 | 27.2.4 | make wording less ambiguous | Original: "if one of the two NAV timers is nonzero," Updated: "if at least one of the NAV timers is nonzero," Change in text addresses the case of when both NAV timers are nonzero as well as if only one is nonzero. | Accepted – The suggested editorial revision has been incorporated by the editor in D2.2. See D2.2 and the resolution for CID 11708. |
| 11489 | Chao Chun Wang | 223.21 | 27.2.4 | HE STA shall maintain .. Two NAVs | Is it necessary to make it a "shall"? There is no way to enforce it and it is almost impossible to verify. It serves no real purpose by saying HE STA "shall". Change it to "may". | Rejected- The purpose of maintiaitng two NAV timers is described in the second paragraph of 27.2.4. Verifing the mechanism can be achieved by the following test. Setuping up two APs, say AP1 and AP2, and an associated STA to AP1. Assume that two APs do not sense each other and the associated STA sense both APs. Have AP2 send any frame that reserved medium and AP1 to send Trigger frame to the STA after the transmission of AP2 and during the TXOP reserved by AP2. To pass the test, STA shall not respond.   |
| 11793 | Graham Smith | 223.20 | 27.2.4 | "A non-AP HE STA shall maintain and an HE AP may maintain two NAVs, one referred to as intra-BSS NAV and the other as basic NAV." Rephrase correctly/ | Replace cited text with "A non-AP HE STA shall maintain and an HE AP may maintain two NAVs: intra-BSS NAV and basic NAV." | Accepted – |
| 11797 | Graham Smith | 225.03 | 27.2.4 | "The exact time of updating the NAVs uses the same rule as defined in 10.3.2.4". Is this really the 'exact time' or is it simply update the NAV? | Replace cited text with "The NAVs are updated using the rule as defined in 10.3.2.4..." | Rejected –The intention is about the exact time, which is described in 10.3.2.4 as the following.*This NAV update operation is performed when the PHY-RXEND.indication primitive is received, except when the PHYRXEND.indication primitive is received before the end of the PPDU, in which case the NAV update is performed at the expected end of the PPDU.* The rule of updating two NAVs is described in 27.2.4. |
| 12088 | Jinsoo Ahn | 223.46 | 27.2.4 | A CTS frame transmitted by AP is not considered as intra-BSS frame, so that STAs set regular NAV after receiving the CTS frame. It means the NAV set by the CTS frame can be cancelled by non-intra BSS CF-END. And, AP cannot reset the NAV either. | Use AP address as a RA value to prevent HE STAs from setting regular NAV instead of intra NAV.(Aggressive method) Or if an HE STA receaive a CTS frame without AP address shall set both intra NAV and regular NAV.(Conservative method) | Rejected – Based on the following rule in 27.2.2, STA can compare RA with the BSSID of its own BSS. As a result, STA can classify the CTS frame from its own AP as intra-BSS frame.*Otherwise, a STA that obtains at least the RXVECTOR for a PPDU shall classify the PPDU as an intra-BSS frame if at least one of the following conditions is true:** *The PPDU carries a frame that has an RA, TA or BSSID field value that is equal to the BSSID of the BSS or the BSSID of any BSS that is a member of the same multiple BSSID set as the BSS of which the STA is a member. The Individual/Group bit in the TA field value is forced to the value 0 prior tothe comparison.)*
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| 12177 | kaiying Lv | 223.18 | 27.2.4 | When a HE STA is not associated with a AP, which NAV is updated by a received PPDU? . | Please clarify it | Rejected – When a STA is not associated with a AP, there is no way for the STA to classify any frame as intra-BSS frame. As a result, only basic NAV will be updated. |
| 12572 | Mark Hamilton | 223.30 | 27.2.4 | Use normative verbs. Is this really an example, or is the prescribed behavior? | Delete "For example". Change "can" to "shall" on lines 31 and 34. | Revised – The description of the paragraph is an example. We revised the workding by removing “can” and “will”.TGax editor to make the changes shown in 11-18/0353r0 under all headings that include CID 12572. |
| 13007 | Massinissa Lalam | 224.08 | 27.2.4 | What happens to the intra-BSS NAV of a STA that is not a TXOP holder and that receives a Trigger Frame containing its AID during the TXOP. The condition "The RA of the received frame is not the STA's MAC address or the PPDU carrying the frame does not solicit an immediate response from the STA STA or the received frame is a Trigger frame ." will be true since the last condition (the received frame is a Trigger frame) is true (the first one will be true as well since the broadcast address is not the STA's MAC address, only the second condition will be false). So the intra-BSS NAV will be set. Is this really the intended behavior to have a scheduled STA sets its NAV? | Clarify the conditions an intra-BSS NAV is set be a STA that is not a TXOP holder and that receives a trigger frame that solicits a response from the STA. | Rejected – The specific case mentioned by the commeter is discussed duraing the comment resolution of D1.0. The consideration is that a STA that is solicited by the Trigger frame may not respond due to UL MU CS consideration. As a result, if the intra-BSS NAV of the STA is not set, the STA may still contend and interfere the UL MU transmission. An alternative is for the STA to set NAV only after UL MU CS decision. However, this approach changes the current baseline of updating NAV after receving the frames. There will be complicated changes for determining the value of NAV that needs to be adjusted and the timing of updating the NAV.The group agrees to set NAV in UL MU cases to avoid the identified issue and complicated rule. |
| 14102 | Yuichi Morioka | 223.40 | 27.2.4 | OBSS-PD and SRP based SR allows for SR transmission if the received PPDU is an inter-BSS PPDU. Similarly an HE STA should be allowed to transmit at lower power if only the basic NAV is set. | Replace "if one of the two NAV timers is nonzero, the virtualCS indication is that the medium is busy." with "if intra-BSS NAV timer is nonzero, the virtual CS indication is that the medium is busy; if intra-BSS NAV timer is zero, and basic NAV timer is nonzero, the virtual CS indication is that the medium is allowed for Spatial Reuse."The commenter is willing to provide further details. | Rejected – If a STA does spatial reuse, then the basic NAV is not even updated. As a result, there is no need to add further rules.  |
| 14103 | Yuichi Morioka | 223.55 | 27.2.4 | If an HE STA can indicate that the NAV set by the Duration field of the transmitted frame will not be cancelled or updated up until a certain point, then a third party HE STA can enter doze state until that time, which will highly impact power saving. | Add signaling and rule to enable NAV level power saving for HE STAs by indication of static NAV. The commenter is willing to provide a detailed proposal, if the group is willing to go in this direction. | Rejected – 11ax has already developed intra-PPDU PS that utilizes similar concept. See 27.14.1. |
| 14104 | Yuichi Morioka | 225.13 | 27.2.4 | In highly dense environments, there will be cases where there are more than one OBSS that is visible to the STA. The spec should leave the option for NAV management per OBSS. This would be especially useful when the OBSSs are within the same ESS/Group. | Define an optional mechanism where the STA can maintain NAV per OBSS. | Rejected – The proposed mechanism is discussed offline when the two NAV mechanism is introduced. The general opinion is not to go multiple NAVs direction due to the following reasons. The UL MU CS consideration only considers inter-BSS NAV as a whole and does not differentiate different inter-BSS when consider virtual CS indication.The New CF-End only considers reset rule for intra-BSS and inter-BSS rather than reset rule for different inter-BSS.More than 2 NAVs will certainly bring more complexity and complicated rules, which is not necessary based on the understanding that more than 2 NAVs do not align with other concepts introduced in 11ax. |
| 14236 | Yusuke Tanaka | 223.65 | 27.2.4 | What if the RA is broadcast or multicast address? Same comments on the conditions defined in pp223. | Add "broadcast address or multicast address intended for the STA." | Rejected – For broadcast or multicast address, the intention is to set the NAV. Note that in 10.3.2.4, the baseline rule also specifies that if the RA address is not equal to STA’s own address, then the NAV is set provided that other conditions are satisfied. |
| 14262 | Yusuke Tanaka | 253.55 | 27.5.3.5 | The NAV set by an intra-BSS frame is intra-NAV so just simplify by saying "The intra-NAV was set" | As commented. |  |
| 13300 | Robert Stacey | 307.02 | 27.11.5 | PPDUs don't have MAC headers. Setting TXOP\_DURATION should have nothing to do with the received PPDU: PPDUs don't solicit responses; only frames do and they usually have Duration fields. | For a HE TB PPDU set the TXVECTOR parameter TXOP\_DURATION based on the Duration field of the Trigger frame or frame carrying the UMRS Control field. For HE SU PPDU, HE ER SU PPDU or HE MU PPDU set the TXVECTOR parameter TXOP\_DURATION to UNSPECIFIED or the Duration field setting of the frame soliciting the response (QoS Data frame, BlockAckReq frame, etc). | Revised –Agree in principle with the commenter. We revise the sentence as the following “a frame with a Duration field in an HE PPDU” to avoid mentiiong MAC header in a PPDU.TGax editor to make the changes shown in 11-18/0353r0 under all headings that include CID 13300.  |
| 13059 | Osama Aboulmagd | 223.40 | 27.2.3 | how does the requirement that both NAV values are equal to zero to decalre the medium is idel affect access to the medium and consequently the throughput. Have there been any simulation results to show the impact? | Comment on how mesium access probability is changed compared to a single NAV value. | Rejected –The major benefits of two NAVs mechanism is about controlling intra-BSS operation and avoiding interfering inter-BSS operation during UL MU as described in the second paragraph of 27.2.4.There are also addition TXOP truncation rule defined in 10.22.2.9 Truncation of TXOP that increase medium access time.The medium access rule described in the third paragraph is just to clarify the Virtual CS indication when a STA contend the medium using EDCA. This is similar to the description in the fourth paragraph in 10.3.2.1 CS mechanism. |
| 11075 | Adrian Stephens | 225.08 | 27.2.5 | "permitted to reset the NAV which is updated" - grammatical error creates ambiguity. | Either "which" -> "that" if the following text is part of a condition, otherwise "which" -> ", which". | Revised – Agree in principle with the comment. We revise “which” with “that”.TGax editor to make the changes shown in 11-18/0353r0 under all headings that include CID 11075. |
| 14328 | Zhou Lan | 226.30 | 27.2.5.2 | MU-RTS procedure doesn't provide sufficient support for range extension mode operation. A near edge STA after receive MU-RTS frame from AP may not be able to succesfully deliever CTS back to AP. As a consequence AP cannot use ER SU PPDU for DL transmission to the near edge STA. Need to enhance the MU-RTS/CTS operation to enable ER SU PPDU transmission. | as in the comment | Revsied – An AP can send any variants of Trigger frame except MU-RTS Trigger frame to grab the TXOP and send another MU-RTS Trigger frame to do hidden node protection. If the AP does not get any response for the MU-RTS, then AP can continue the TXOP after PIFS recovery. We revise the texts to allow the operation described above.TGax editor to make the changes shown in 11-18/0353r0 under all headings that include CID 14328. |
| 11503 | Chunyu Hu | 226.30 | 27.2.5.2 | MU-RTS procedure doesn't provide sufficient support for range extension mode operation. A near edge STA after receive MU-RTS frame from AP may not be able to succesfully deliever CTS back to AP. As a consequence AP cannot use ER SU PPDU for DL transmission to the near edge STA. Need to enhance the MU-RTS/CTS operation to enable ER SU PPDU transmission. | as in the comment | Revsied – An AP can send any variants of Trigger frame except MU-RTS Trigger frame to grab the TXOP and send another MU-RTS Trigger frame to do hidden node protection. If the AP does not get any response for the MU-RTS, then AP can continue the TXOP after PIFS recovery. We revise the texts to allow the operation described above.TGax editor to make the changes shown in 11-18/0353r0 under all headings that include CID 14328. |
| 11516 | Chunyu Hu | 225.14 | 27.2.5 | The MU-RTS/CTS procedure has a flaw here:if all non-AP STAs are far away from the AP, then none of the CTS can reach AP. However, the DL HE\_MU can actually reach the non-AP STAs as AP may have higher transmission power, and also the HE\_TB transmission done by non-AP STAs can reach AP as transmission can be done in narrow RU. It's unfortunate that the DL MU frame sequence has to abort because of such CTS failure. Should have a way to support/protect DL MU tx to happen over link of extended range. | as in the comment | Revsied – An AP can send any variants of Trigger frame except MU-RTS Trigger frame to grab the TXOP and send another MU-RTS Trigger frame to do hidden node protection. If the AP does not get any response for the MU-RTS, then AP can continue the TXOP after PIFS recovery. We revise the texts to allow the operation described above.TGax editor to make the changes shown in 11-18/0353r0 under all headings that include CID 14328. |
| 13035 | Matthew Fischer | 225.14 | 27.2.5 | Create an option for MU CTS - i.e. for long distance scenarios, the existing MU RTS exchange can fail due to a mismatch in power between the AP and non-AP STA, so if we have an MU RTS followed by MU CTS i.e. HE CTS transmitted on an RU that is less than 242 tones, we can effectively allow a full RTS CTS exchange in the case of a long distance link | Add a mechanism to allow the MU RTS to request HE CTS responses that occupy RU with fewer than 242 tones, possibly with the option of first transmitting a non HT CTS before the HE CTS | Revsied – An AP can send any variants of Trigger frame except MU-RTS Trigger frame to grab the TXOP and send another MU-RTS Trigger frame to do hidden node protection. If the AP does not get any response for the MU-RTS, then AP can continue the TXOP after PIFS recovery. We revise the texts to allow the operation described above.TGax editor to make the changes shown in 11-18/0353r0 under all headings that include CID 14328. |

**Discussion:** *None.*

**Propose:** Revised for CID 11073, 11793, 12572, 11075 per discussion and editing instructions in 11-18/0353r0.

***TGax editor: Change 27.2.4 Updating two NAVs as the following: (Track change on)***A non-AP HE STA shall maintain and an HE AP may maintain two NAVs: intra-BSS NAV and basic NAV.(#11793) The intra-BSS NAV is updated by an intra-BSS PPDU. The basic NAV is updated by an inter-BSS PPDU or a PPDU that cannot be classified as intra-BSS or inter-BSS.(#11794) The mechanism by which a PPDU is classified intra-BSS or inter-BSS is defined in 27.2.2 (Intra-BSS and inter-BSS frame determination).

Maintaining two NAVs is beneficial in dense deployment scenarios in which(#11072) a STA requires protection from frames transmitted by STAs within its BSS, i.e., intra-BSS, and avoid interference from frames transmitted by STAs in a neighboring BSS, i.e., inter-BSS. For example, in a TXOP initiated by the AP to which the STA is associated for an UL MU transmission, the intra-BSS NAV of the STA is(#12572) set by the AP to prevent the STA from contending for the channel. The basic NAV is not (#12572)updated by the AP so that if the basic NAV was set by an inter-BSS PPDU with nonzero value at the time of responding UL MU, the virtual CS indicasts busy in (#11073) the UL MU CS mechanism described in 27.5.3.5 (UL MU CS mechanism).

(…existing texts…)

An HE STA that used information from an RTS or MU-RTS Trigger frame as the most recent basis to update its NAV setting is permitted to reset the NAV that(#11075) is updated by the RTS or MU-RTS Trigger frame (#11075) if no PHY-RXSTART.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 RTS or MU-RTS Trigger frame.

**Propose:** Revised for CID 13300 per discussion and editing instructions in 11-18/0353r0.

***TGax editor: Change 27.11.5 TXOP\_DURATION as the following: (Track change on)***

(…existing texts…)

A STA(#13297, #13299) that transmits a frame with a Duration field in an HE PPDU with the TXVECTOR parameter TXOP DURATION not set to UNSPECIFIED (#13300) shall set the TXVECTOR parameter TXOP\_DURATION to the duration information indicated by the Duration field if the value of the Duration field is smaller than 8448 µs. Otherwise, the TXVECTOR parameter TXOP\_DURATION is set to 8448.

(…existing texts…)

**Propose:** Revised for CID 14328 per discussion and editing instructions in 11-18/0353r0.

***TGax editor: Change 27.2.5.2 MU-RTS procedure as the following: (Track change on)***

* MU-RTS procedure

(…existing texts…)

After transmitting an MU-RTS Trigger frame, the STA shall wait for a CTSTimeout interval with a value of aSIFSTime + aSlotTime + aRxPHYStartDelay. This interval begins when the MAC receives a PHY-TXEND.confirm primitive. If a PHY-RXSTART.indication primitive does not occur during the CTSTimeout interval, the STA shall conclude that the transmission of the MU-RTS Trigger frame has failed, and this STA shall invoke its backoff procedure upon expiration of the CTSTimeout interval if the MU-RTS Trigger frame initiates a TXOP.(#14328). If a PHY-RXSTART.indication primitive does occur during the CTSTimeout interval, the STA shall wait for the corresponding PHY-RXEND.indication primitive to determine whether the MU-RTS Trigger frame transmission was successful. The recognition of a valid CTS frame sent by any recipient of the MU-RTS Trigger frame, corresponding to this PHY-RXEND.indication primitive, shall be interpreted as the successful transmission of the MU-RTS Trigger frame, permitting the frame exchange sequence to continue. The recognition of anything else, including any other valid frame, shall be interpreted as failure of the MU-RTS Trigger frame transmission. In this instance, the STA may process the received frame and shall invoke its backoff procedure at the PHY-RXEND.indication primitive if the MU-RTS Trigger frame initiates a TXOP.(#14328)

(…existing texts…)