IEEE P802.11
Wireless LANs

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| LB 203 Comment Resolution for Clause 9.49.5 |
| Date: 2014-07-14 |
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Abstract

This submission proposes resolutions for comments in clause 9.49.5 of TGah Draft 2.0 with the following CIDs (10 CIDs):

* 3499, 4119, 4155
* 3842, 3843, 3846
* 3847, 3848, 4118, 4120

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 TGah Draft. This introduction is not part of the adopted material.

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

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

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| **CID** | **P.L** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| 3499 | 307.57 | 9.49.5 | "A Relay can use either:" -- thiny veiled normative statement. | Replace "A Relay can use" with "A relay may use". | Rejected –The normative behaviour related to this declarative statement can be found in the next paragraph of the same subclause: “When a Relay (relay-STA or relay-AP) receives a valid Short Data frame with the Relayed Frame field in the Frame Control field equal to 1, the Relay may acknowledge the received Short Data frame using the Implicit or Explicit Ack procedure.” |
| 4119 | 308.5 | 9.49.5 | 308 | Modify as "The frames transmitted over the first hop and second hop can be sent at two different MCSs and on two different sub channels. | Revised –As pointed out by commenter of CID 3843, access in a channel that is not the primary channel required PIFS time, while TXOP sharing enables SIFS separated transmissions. Hence, proposed resolution is the same as for CID 3843 which clarifies the BW limits of operation for TXOP sharing.TGah editor to make changes shown in 11/14/0966r0 under all headings that include CID 4119. |
| 4155 | 307 | 9.49.5 | Downlink TXOP sharing procedure via Relay can not be used in real world at all because most of non-AP STAs would be in doze state(Power Save Mode) when AP triggers downlink TXOP sharing via Relay. In the most of real scenario, Relay will halt the TXOP sharing triggered by AP. If AP initiate a relay-shared TXOP by sending an S1G RTS frame before start TXOP sharing, Relay can not respond with CTS frame because Relay can not relay the following data frame within Duration set in the RTS by AP. I would like to raise two issues here. 1) For useful Downlink TXOP sharing procedure in real world, TGah must have a mechanism to synchronize power state among AP, Relay, and non-AP STA. 2) When Relay determined not to be able to relay following data frame within Duration in RTS, there should be an exit mechanism the protection request procedure. | 1) For useful Downlink TXOP sharing procedure in real world, add a mechanism to synchronize power state among AP, Relay, and non-AP STA. 2) add an exit mechanism the protection request procedure when Relay determined not to be able to relay following data frame within Duration in RTS | Rejected –Proposed resolution for item 1) is the same as for CID 2825 (see 11-14/0560r1) because the comments are very similar in nature. And the proposed resolution for that CID is quoted below:“In a TXOP shared session for downlink transmission it is the Relay’s decision whether to forward the DL BU immediately or wait in a second moment. The AP in this case simply indicates to the Relay that it is allowed to perform TXOP Sharing, but the Relay should choose not to do so if the non-AP STA is in Doze state.”Regarding item 2) note that a Relay that is not able to relay the data within the relay-shared TXOP does not use either implicit Ack or explicit Ack to forward the frame but simply acknowledges the received frame and it can subsequently access the medium within an independent TXOP to transmit the data to the destination. |

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| 3842 | 307.52 | 9.49.5.2 | "A STA that intends to share the TXOP with the Relay starts the TXOP by sending to the Relay an S1G RTS frame with the Order field set to 1 or a Short Data frame that has the Relayed Frame field set to 1."Change "A STA that intends to share the TXOP with the Relay starts the TXOP by sending to the Relay an S1G RTS frame with the Order field set to 1 or a Short Data frame that has the Relayed Frame field set to 1." to "A STA that intends to share the TXOP with the Relay may start the TXOP by sending to the Relay an S1G RTS frame with the Order field set to 1 or a Short Data frame that has the Relayed Frame field set to 1." | As in comment. | Accepted –The commenter suggests changing the declarative statement to a normative statement by replacing “starts” with “may start”. Agree with the commenter because the STA can also initiate the TXOP by sending an RTS with Order field equal to 0. |
| 3843 | 307.31 | 9.49.5.2 | Add the following text in appropriate place in the subclause: when relay sharing is used, the all transmissions shall use the same channel bandwidth and in the same channel.The reason that I ask for such addition is that when different channel is used, PIFS has to be used for medium detection. | As in comment. | Revised –Partially agree with the commenter because the transmissions within the TXOP can use a lower BW (for example dynamic BW signalling is enabled by the TXOP initiator in a transmitted RTS). Also any suggested limitation should apply for both (implicit and explicit ack) procedures. Hence, proposed change is to add the limitation under 9.49.5 (Procedures of TXOP sharing).TGah editor to make changes shown in 11/14/0966r0 under all headings that include CID 3843. |
| 3846 | 307.31 | 9.49.5.2 | Add the following text to define when TXOP sharing can be used:When only one data frame is transmitted by root AP (the STA which is associated with a non-root relay AP) or the last data frame that is transmitted by root AP (the STA which is associated with a non-root relay AP), TXOP sharing may be used. | As in comment. | Revised –Agree in principle with the commenter. Proposed change is inline with the suggestion of the commenter. However, also in this case the limitation should apply for both (implicit and explicit ack) procedures. Hence, proposed change is to add the limitation under 9.49.5 (Procedures of TXOP sharing).TGah editor to make changes shown in 11/14/0966r0 under all headings that include CID 3846. |

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| 3847 | 309.38 | 9.49.5.3 | Special rules of protection are not necessary and make the implementation complicate | remove the subclause and use the normal Duration/ID setting rules. | Revised –The TGah group believes that Relay-shared TXOP protection mechanisms are necessary. But, note that the adoption of these rules is optional from both TXOP initiator and TXOP responder. In order to make it clearer the following is added in this Subclause: “The S1G STA may set the Order field of the RTS frame to 0 to indicate that it expects an NDP CTS whose Duration field is set as described in 9.3.2.6 (CTS and DMG procedure). Otherwise, it may set the Order field to 1 to indicate that it expects an NDP CTS whose Duration field is set as described in this subclause.”TGah editor to make changes shown in 11/14/0966r0 under all headings that include CID 3847. |
| 3848 | 309.65 | 9.49.5.3 | "the Relay (relay-STA or relay-AP) should protect the Short Data frame transmission with an RTS/CTS protection mechanism"This can't be implemented. | Delete the sentence. | Rejected –The commenter fails to identify a real issue. An example of implementation of this could be the following: “RTS (Relay STA)/CTS (Root AP)/Short Data frame (Relay STA)/Ack (Root AP). |
| 4118 | 309.54 | 9.49.5.3 | The meaning of "T PPDU" is misleading. | Rename "T PPDU" to "T NDPCTS". | Revised –Agree with the commenter that the terminology can be misleading because in 8.2.5.2 TPPDU refers to the duration of time of the current PPDU. Proposed resolution is to change the name of the variable to *TCTS*.TGah editor to make changes shown in 11/14/0966r0 under all headings that include CID 4118. |
| 4120 | 309.42 | 9.49.5.3 | The relay-shared TXOP protection mechanism should work under RAW and TWT. | Modify as "An S1G STA that ..... in exchange within DCF." | Rejected –The commenter suggest changing “under EDCA” with “within DCF” in order to allow the TXOP protection for RAWs and TWT as well. However, please note that this is not necessary because an S1G STA is a QoS STA (see 9.21.2.1) and as such uses EDCA to access the channel rather than pure DCF (including within TWT and RAW). |

* **Procedures of TXOP sharing for relay operation**

**Instructions to TGah Editor: *Change this subclause as follows:***

An S1G STA that supports TXOP sharing procedure may set the Relayed Frame field in the Frame Control field of Short Data, the Relayed Frame field in NDP Ack frames, and the Order field in the Frame Control field of an S1G RTS frame to 1. Otherwise, it shall set the Relayed Frame field or Order field in any frame to 0 unless the frame is an NDP Ack frame used for flow control as described in 9.56 (Flow control). The S1G STA may use TXOP sharing to transmit to the Relay (relay AP or relay STA) either one Short Data frame or the last Short Data frame of the TXOP.Reception of a valid Short Data frame with the Relayed Frame field equal to 1 or of an S1G RTS frame with the Order field equal to 1 indicates a relay-shared TXOP.

An S1G STA indicates support of TXOP Sharing with Implicit Ack using the TXOP Sharing Implicit Ack Support subfield of the S1G Capabilities Info field in the S1G Capabilities element. If dot11TXOPSharingImplicitACKSupportImplemented is true, the S1G STA shall set the TXOP Sharing Implicit Ack Support subfield to 1 in transmitted frames containing the S1G Capabilities element. Otherwise, the S1G STA shall set the TXOP Sharing Implicit Ack Support subfield to 0.

A non-S1G STA shall not perform TXOP sharing.

A Relay entity shall not perform TXOP sharing if the relay-STA and relay-AP are operating in different primary channels for the duration of the TXOP. A Relay that performs TXOP sharing shall use a channel width that is the same or lower than the channel width indicated by the STA that initiated the TXOP.

The sequence of frames exchanged over the first hop and second hop depends on the acknowledgement procedure used by the Relay. A Relay can use either:

* Explicit Ack procedure
* Implicit Ack procedure

When a Relay (relay-STA or relay-AP) receives a valid Short Data frame with the Relayed Frame field in the Frame Control field equal to 1, the Relay may acknowledge the received Short Data frame using the Implicit or Explicit Ack procedure. The Relay shall not acknowledge the received valid Short Data frame using either Implicit or Explicit Ack procedure if the Relayed Frame field in the Frame Control field is equal to 0 in the received Short Data frame.

NOTE- The frames transmitted over the first hop and second hop can be sent at two different MCSs.

For error recovery purposes, during a relay-shared TXOP, the TXOP owner may transmit its next PPDU when the CS mechanism (see 9.3.2.1 (CS mechanism)) indicates that the medium is idle at the TxPIFS slot boundary (defined in 9.3.7 (DCF timing relations)) (this transmission is a continuation of the current TXOP or SP).

* **Implicit Ack procedure**

**Instructions to TGah Editor: *Change this subclause as follows:***

The implicit ack procedure is available only when the partial AID information is included in the PLCP header of the PPDU that carries the frame (i.e., the PREAMBLE\_TYPE is either S1G\_SHORT\_PREAMBLE or S1G\_LONG\_PREAMBLE).

A STA that intends to share the TXOP with the Relay may start the TXOP by sending to the Relay an S1G RTS frame with the Order field set to 1 or a Short Data frame that has the Relayed Frame field set to 1. A Relay (relay-STA or relay-AP) that is the intended receiver of the S1G RTS frame which intends to use the implicit ACK shall respond with an NDP CTS frame with the Duration field set as described in 9.49.5.3 (Relay-shared TXOP protection mechanisms).

When a Relay receives a Short Data frame during a relay-shared TXOP, the Relay may directly forward the received frame without sending back an acknowledgement frame to the transmitter of the frame. If the Short Data frame was preceded by an RTS frame then the Relay should protect the forwarded frame by sending an RTS frame to the intended receiver as described in 9.49.5.3 (Relay-shared TXOP protection mechanisms).

If the MPDU is transmitted by a non-AP STA, which is associated to a relay-AP, to the AP, then the relay-AP forwards the received MPDU to the AP to which it is associated, using SIFS. After transmitting the MPDU, the non-AP STA shall wait for an ACKTimeout interval, with a value of aSIFSTime + aSlotTime + aRxPHYStartDelay, starting at the PHY-TXEND.confirm primitive. If the non-AP STA receives a valid PLCP header within the ACKTimeout interval and the partial AID in the received PLCP header is identical to the partial AID corresponding to BSSID of the AP, the non-AP STA recognizes it as a successful acknowledgement, permitting the frame sequence to continue, or to end without retries, as appropriate for the particular frame sequence in progress.

If the MPDU is transmitted by an AP to a relay-STA, then the relay-STA forwards the received MPDU to the non-AP STA that is associated to the relay-AP, using SIFS. After transmitting the MPDU, the AP shall wait for an ACKTimeout interval, with a value of aSIFSTime + aSlotTime + aRxPHYStartDelay, starting at the PHY-TXEND.confirm primitive. If the AP receives a valid PLCP header within the ACKTimeout interval and the partial AID in the received PLCP header is identical to the partial AID corresponding to the DA of the transmitted MPDU, the AP recognizes it as successful acknowledgement, permitting the frame sequence to continue, or to end without retries, as appropriate for the particular frame sequence in progress. If the RA of the forwarded MPDU is different from the DA of the MPDU transmitted by the AP, then the relay-STA shall use the explicit ack procedure.

An AP to which the the relay-STA is associated may use the implicit ack procedure to transmit a downlink frame to a non-AP STA only if it knows the partial AID of the non-AP STA associated to the relay-AP. For this purpose the relay-STA may indicate an associated STA's AID to the AP by sending a STA Information Announcement frame including an AID Announcement element when the non-AP STA becomes associated or the non-AP STA's AID is changed.

A non-AP STA associated to a relay-AP may use the implicit ack procedure to transmit an uplink frame to an AP only if it knows the BSSID of the AP to which the relay-STA of the Relay is associated. For this purpose, the relay-AP may indicate the BSSID of the AP to newly associated non-AP STAs by using RootAP BSSID field in the Relay element in Beacon frame, Probe Response, or Short Probe Response frame.

* **Relay-shared TXOP protection mechanisms**

**Instructions to TGah Editor: *Change this subclause as follows:***

An S1G STA that supports TXOP sharing should initiate a relay-shared TXOP by sending an S1G RTS frame as the first frame in the exchange under EDCA. The S1G STA may set the Order field of the RTS frame to 0 to indicate that it expects an NDP CTS whose Duration field is set as described in 9.3.2.6 (CTS and DMG procedure). Otherwise, it may set the Order field to 1 to indicate that it expects an NDP CTS whose Duration field is set as described in this subclause.

A Relay that is the intended receiver of the S1G RTS frame with the Order field equal to 1 and intends to use the relay-shared TXOP responds with an NDP CTS frame with a value of the Duration field which depends on the acknowledgment procedure it shall use during this relay-shared TXOP:

* If explicit ack procedure (see 9.49.5.1 (Explicit Ack procedure) then the Duration field of the NDP CTS shall be set to a value D:
* D = *TRTS +TPENDING – TCTS <= D <= TTXOP \_REMAINING-TPPDU*
* where *TRTS* is the value obtained from the Duration/ID field of the S1G RTS frame that elicited the response, *TCTS* is the time, in microseconds, between the end of the PPDU carrying the RTS frame and the end of the NDP CTS frame, *TPENDING* is the estimated time required for the transmission of the frame to be forwarded, its response if required, protection frame exchanges if required, plus applicable IFS durations, and *TTXOP\_REMAINING* is equal to any *TTXOP* as defined in 8.2.5.2 (Setting for single and multiple protection under enhanced distributed channel access (EDCA)) minus *TRTS*.
* If implicit ack procedure (see 9.49.5.2 (Implicit Ack procedure)), then the Duration/ID field of the NDP CTS frame shall be set according to 8.2.5.7 (Setting for control response frames). When using the implicit ack procedure, upon successful reception of a Short Data frame that is preceded by the transmission of an NDP CTS frame as described above, the Relay (relay-STA or relay-AP) should protect the Short Data frame transmission with an RTS/CTS protection mechanism. The Duration/ID field of the RTS frame shall be less than or equal to *TTXOP* for that AC, as defined in 8.2.5.2 (Setting for single and multiple protection under enhanced distributed channel access (EDCA)), minus the estimated time since the start of the reception of the RTS frame with the Order field equal to 1 that was sent by the relay-shared TXOP owner.

A Relay (relay-STA or relay-AP) that uses the relay-shared TXOP may transmit an (NDP) CF-End frame after successfully forwarding the Short Data frame if the remaining duration is long enough to transmit this frame.

A Relay that is the intended receiver of the S1G RTS frame with the Order field equal to 0 responds with an NDP CTS frame as described in 9.3.2.7 (CTS and DMG CTS procedure).