IEEE P802.11
Wireless LANs

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| Figure 9-102 proposal for TGah |
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Abstract

This submission contains a proposed comment resolution for TGah LB 207 CIDs 6159 and 6156:

R0 – Initial proposal.

R1 – Added resolution of CID 6156, with proposed changes in 4.3.13a.2 and 9.51.3.

R2 – Fixed a typo (“SA” should have been “DA”)

# CIDs 6159 and 6156

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| 6159 | 325.07 | 9.51.1 | While Figure 9-102 illustrates a relay at a very high level, it is the only architectural figure we have and it isn't very specific or detailed in architecture, or complete, since it doesn't show a two-hop (or more) path. | See 11-15/258 for a proposal. |
| 6156 | 10.43 | 4.3.13a.2 | New text in 4.3.13a.2 implies that relay is only forwarded once - especially the uplink side. Add some claritifcation that it could be multi-hop. Especially make sure clause 9 stuff is clear about this, and clear about "intermediate" nodes being both forwarding and end stations. And make sure clause 9 is clear how multi-hop works - I think there is no decision making on uplink, and on downlink it is strictly based on the Reachable Address information (?)Make it clear in intro text in 9.51.1 and it would help to show in Figure 9-102, that relay structures can be more than one relay hop. | Add to end of the second paragraph of 4.3.13a.2, "... which may be the destination STA, or another relay STA." In the third paragraph, change "transmits the frame to the root AP" to "transmits the frame to the root AP or another relay AP". |

**Discussion:**

The S1G relay concept has been designed to support “multiple hops”, such that an S1G relay could associate to another S1G relay in order to get connectivity to the root AP. This is understandable and derivable only from carefully reading the details of the text. It seems it would be easier for the reader to understand if this was made clear in the introduction and overview text and figures.

Thus, a proposal is made to add a two hop path to Figure 9-102, and to adjust the introduction text to match.

Secondly, the construction of an S1G relay is more than just an AP and a STA, as there is additional, new activity going on inside a relay to decide how and when to forward frames. It seems that this is known as the “relay function” in places in the text, so that term is suggested to be used a bit more formally to represent this behavior. Finally, then, an S1G relay comprises the AP the STA and the relay function, to complete the architectural view. The details of this are probably best done in clause 5, where the architectural elements affecting the data plane are covered, and another comment on LB 207 covers this (see proposed changes in 11-15/0257. However, it would be good to carry the concept into Figure 9-102 here for both consistency and information for the reader who doesn’t look at clause 5 details.

Both these changes are represented in the Proposed changes, below.

Finally, in considering CID 6156, the change proposed by the commenter is pretty straightforward, simply noting that as a relay forwards a frame, the destination of that forward might be just to a next relay in a multi-hop path, or it might be to the final destination. The proposal is to Accept those changes.

The comment itself asks for a check that clause 9 is clear about the forwarding process, that the relay might be part of a multi-hop path, and that the relay is also an end station. Considering this, note that 9.3.6 is modified in the current draft to be clear about group addressed frame forwarding in the uplink and downlink directions (separately and explicitly), and that seems to be clear and complete. Subclauses 9.51.3 and 9.51.4 provide the rest of the details on the forwarding procedure, and seem clear that a relay STA or relay AP are also end stations.

However, none of the text in 9.3.6, 9.51.3 or 9.51.4 mentions using Reachable Address information as part of the forwarding process. The downlink forwarding rules for individually addressed frames are contained in this statement in 9.51.3, “MSDUs at an AP which are not destined for the AP or one of its associated non-AP STAs are forwarded via the WM to an appropriate relay STA.” There doesn’t seem to be any further text explaining what “appropriate” means. The proposed changes below recommend clarifying that the Reachable Address information can be used to make this determination.

**Proposed changes:**

4.3.13a.2 Relay

. . .

Frames that are relayed in the downlink direction (i.e. from the root AP to a STA) are transmitted by the root AP to the relay STA using a 4-address frame or using an A-MSDU. The relay STA forwards the frame to the relay AP, which then transmits the frame to the next STA which may be the destination STA, or another relay STA.

Frames that are relayed in the uplink direction (i.e. from a STA to the root AP) are transmitted by the STA to a relay AP. The relay AP forwards the frame to the relay STA, which then transmits the frame to the root AP or another relay AP using a 4-address frame or using an A-MSDU.

9.51 S1G Relay operation

**9.51.1 General**

A relay consists of a relay AP, a relay STA and a relay function.

A relay STA is a non-AP STA with dot11RelaySTAOperation equal to true. A relay AP is an AP with dot11RelayAPOperation equal to true.

An example of a relay function is illustrated in Figure 9-102 (S1G Relay Architecture), where Relay 1, Relay 2 and Relay 3 are relays, both of which consisting of a relay STA, a relay AP and a relay function. The relay STAs of Relay 1 and Relay 2 are associated with an AP that is a root AP. The relay STA of Relay 3 is associated with the relay AP of Relay 1. STA 1 is a non-AP STAs associated with the relay AP of relay 1. STA 2 and STA 3 are non-AP STAs associated with the relay AP of relay 3. STA 4 and STA 5 are non-AP STAs associated with the relay AP of relay 2. Frames from STA 1 are forwarded via the relay function of relay 1 from the relay AP to the relay STA and then to the root AP. Similarly, frames from the root AP are forwarded to STA 1 via the relay STA, the relay function and the relay AP of relay 1. Similar forwarding is done by relay 3 and relay 1 in sequence to handle frames for STA 2 and STA 3 relaying multiple times to or from the root AP.





**Figure 9-102—S1G Relay Architecture**

**9.51.3 Addressing and forwarding of individually addressed relay frames**

. . .

MSDUs at an AP which are not destined for the AP or one of its associated non-AP STAs are forwarded via the WM to the relay STA that most recently reported in a Reachable Address element that it added a STA with MAC Address matching the DA of the MSDU. The forwarding frame uses either a 4-address frame format or an A-MSDU format.

**Proposed resolution: Revised**

Make the changes as shown in 11-15/0258r2.