IEEE P802.11
Wireless LANs

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| Comment Resolutions for 11be D2.0 Proxy ARP CIDs |
| Date: 2022-10-04 |
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Abstract

This submission proposes resolutions of comments received from TGbe LB266 (TGbe Draft 2.0).

* CIDs: 13154 (1 CIDs)

Revisions:

* Rev 0: Initial version of the document.
1. **Introduction**

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 TGbe Draft. The introduction and the explanation of the proposed changes are not part of the adopted material.

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

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

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| CID | Commenter | Clause  | Page | Line | Comment | Proposed Change | Resolution |
| 13154 | Mark RISON | 11.21.14 | 330 | 37 | REVme has made significant changes to the specification of proxy ARP | Make sure the changes proposed here are aligned with 11me/D2.0 | **Revised.**Agree with the comment to align the proposed changes in clause 11.21.14 (Proxy ARP service) based on the changes made by REVme.TGbe editor to make the changes shown in IEEE 802.11-22/1685r0 under all headings that include CID 13154. |

SP: Do you agree to incorporate the changes provided in IEEE 802.11-22/1685r0 for CID 13154 to the next revision of 802.11be draft?

11.21.14 Proxy ARP service (CID 13154)

***TGbe editor: Modify the sub-clause as the following (Track Changes ON). NOTE - Underlined text are new text added in 11be:***

Implementation of the proxy ARP service is optional for a WNM STA. A STA that implements the proxy ARP service has dot11ProxyARPImplemented equal to true. When dot11ProxyARPImplemented is true, dot11WirelessManagementImplemented shall be true. When dot11ProxyARPActivated is true, the Proxy ARP Service bit in the Extended Capabilities field shall be set to 1 to indicate that the AP supports the proxy ARP service. When dot11ProxyARPActivated is false, the Proxy ARP Service bit shall be set to 0 to indicate that

the AP does not support the proxy ARP service.

When the AP sets the Proxy ARP field to 1 in the Extended Capabilities element, the AP shall maintain a Hardware Address to Internet Address mapping for each associated STA and for each IPv4 and IPv6 address of the STA, and shall update the mapping when one of the addresses of the associated STA changes. (#13154)

 and for each IPv4 and IPv6 address of the non-AP MLDone of aesA Proxy ARP service receives and processes three types of messages: IPv4 ARP requests, IPv6 ND address lookups, and IPv6 ND duplicate address detection (DAD) messages. These messages are all received as group addressed. If the target address is not known, the Proxy ARP service does not forward the request to the BSS. If the target address is known, the Proxy ARP service can either respond directly on behalf of a STA or forward the request as a unicast frame to the intended STA. For fixed devices in doze state, a direct response is preferable. Otherwise, forwarding as unicast is recommended, to avoid responding with misleading information.

For IPv4, when the address being resolved in the ARP request (IETF RFC 826) is used by a non-AP STA currently associated to the BSS, the proxy ARP service shall either respond on behalf of the STA to an ARP request or an ARP probe (IETF RFC 5227) or preferably turn the ARP request into a unicast frame sent to that STA.

When the IPv4 address being resolved in the ARP request (IETF RFC 826) is used by a non-AP MLD currently associated with the AP MLD, the proxy ARP service shall (#13154) either respond on behalf of the non-AP MLD to an ARP request or ARP probe (IETF RFC 5227) or preferably turn the ARP request into a unicast frame sent to that non-AP MLD.

When an AP receives an IPv4 ARP request from one associated STA or from the DS with a target IPv4 address that corresponds to a second associated STA, the AP that decides to form a proxy ARP response frame shall insert the second STA MAC address as the (#479)sender's MAC address in the ARP response. When an AP affiliated with an AP MLD receives an (#13154) IPv4 ARP request from one associated STA, or from a STA affiliated with a non-AP MLD that is associated with the AP MLD, or from the DS, with a target IPv4 address that corresponds to a second associated STA, the AP shall insert the second STA MAC address as the Sender’s MAC Address in the ARP response packet. When an AP MLD receives an IPv4 ARP request from a STA associated with an affiliated AP, or from one associated non-AP MLD via any affiliated AP, or from the DS, with a target IPv4 address that corresponds to a second associated non-AP MLD, the AP MLD that decides to form a proxy ARP response shall insert the MLD MAC address of the second non-AP MLD as the Sender’s MAC Address in the ARP response packet.

In contrast to IPv4, Stateless Address Autoconfiguration (SLAAC), which is part of IPv6 Neighbor Discovery (ND), enables a node to form multiple addresses, some of them temporary and with a particular attention paid to privacy. SLAAC addresses may be formed and deprecated asynchronously to the association. Even if the knowledge of IPv6 addresses used by a STA (#13154) (or a non-AP MLD) can be obtained by snooping protocols such as IPv6 ND and DHCPv6, or by observing data traffic sourced at the STA, such methods provide only an imperfect knowledge of the state of the STA at the AP (or of the non-AP MD at the AP MLD), in particular when SLAAC is enabled. Running a Proxy ARP service on an incomplete set of addresses may result in a loss of connectivity, in particular for addresses rarely used and in situations of mobility.

This nondeterministic representation of IPv6 address location and binding may also result in

undesirable state persistence in the AP when a STA (#13154) (or in the AP MLD when a non-AP MLD) ceases to use an IPv6 address. It follows that protocol snooping is not a recommended technique and that snooping should only be used as last resort. IETF RFC 8505 defines an address registration mechanism that enables the AP to maintain a deterministic knowledge of all the IPv6 addresses of all the associated STAs. IETF RFC 8929 defines a proxy ND service that leverages the address registration to maintain an accurate proxy state that follows the movements of the STAs (or the non-AP MLDs), while IETF RFC 8928 protects the address ownership against impersonation attacks and address spoofing.

The proxy ARP function for IPv4 and IPv6 shall support snooping of DHCPv4, DHCPv6, and IPv6 ND to discover the IPv4 and IPv6 addresses owned by the STA (#13154) (or the non-AP MLD).

For IPv6, since the state obtained by snooping SLAAC is unreliable, the proxy ARP function shall support the backbone router function defined in IETF RFC 8929, which creates a binding state based on an IETF RFC 8505 registration by the STA (#13154) (or the non-AP MLD). The proxy ARP function should support IETF RFC 8928 to protect the ownership of the addresses. The non-AP STA (#13154) and the non-AP MLD shall support the address registration mechanism defined in IETF RFC 8505 and should support the address protection mechanism defined in IETF RFC 8928.

IPv6 ND uses IP layer multicast Internet Control Message Protocol version 6 (ICMPv6) Neighbor Solicitation (NS) messages (section 4.3 of IETF RFC 4861) for address resolution (section 7.2 of IETF RFC 4861), which is the equivalent of ARP request, and for duplicate address detection (DAD). The proxy ARP function shall drop those messages if the target IP address does not correspond to an associated STA (#13154) (or an associated non-AP MLD). NS messages are sent as IP layer unicast for neighbor unreachability detection (NUD) (section 7 of IETF RFC 4861). The proxy ARP function shall not operate on IP layer unicast NS messages.

With the IPv6 ND proxy operation defined in IETF RFC 8929, the backbone router function at the AP typically operates as a bridging proxy though operation as a routing proxy is also possible. As a bridging proxy, the NS lookups are replied with the MAC address of the STA (#13154) (or the non-AP MLD), and the packets to the STA (or the non-AP MLD) are bridged normally; as a routing proxy, the backbone router function replies to lookups from the wired backbone with its own MAC address and then routes to the STA (or the non-AP MLD) at the IP layer. The routing proxy isolates the layer-2 domains and hides the MAC address of the STA (or the non-AP MLD) in the wired backbone, for a better stability and scalability of the bridged domain. The Proxy ARP function shall support the bridging proxy and may support the routing proxy

operation.

When the target IPv6 address of a IP layer multicast NS message corresponds to an associated STA, the Proxy ARP service may respond on behalf of an associated low-power STA with a neighbor advertisement (NA) message (section 4.4 of IETF RFC 4861) with the override flag set to zero, to conserve energy. Preferably, though, the Proxy ARP service should transmit the IP layer multicast NS message as a unicast frame to the STA and let the STA respond, as recommended in IETF RFC 8929. When MAC address mappings change, the AP may send unsolicited Neighbor Advertisement messages on behalf of a STA if the IPv6 Neighbor Discovery function at the STA failed to do so. (#13154) When the target IPv6 address of an IP layer multicast NS message corresponds to an associated non-AP MLD, the Proxy ARP service may respond on behalf of the non-AP MLD with a neighbor advertisement (NA) message (section 4.4 of IETF RFC 4861) with the override flag set to zero. Preferably, though, the Proxy ARP service should transmit the IP layer multicast NS message as a unicast frame to the non-AP MLD and let the non-AP MLD respond, as recommended in IETF RFC 8929. When MAC address mappings change, the AP MLD may send unsolicited Neighbor Advertisement messages on behalf of a non-AP MLD if the IPv6 Neighbor Discovery function at the non-AP MLD failed to do so.

The IPv6 ND function at the STA (#13154) and the non-AP MLD shall register all of the IPv6 addresses on the interface (see section 10 of IETF RFC 8929) to the proxy ARP service at the AP (or the AP MLD) to ensure that the proxy ARP service is aware of all those addresses and will proxy for them. The proxy ND operation may support address mobility (section 6 of IETF RFC 8929) to transfer a role of ND proxy for this STA to the AP with which the STA is associated (or for the non-AP MLD to the AP MLD with which the non-AP MLD is associated) following a mobility event.

--------- End of text changes --------------