IEEE P802.11
Wireless LANs

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| Comment Resolutions for CC36 11be D1.0 Proxy ARP CIDs |
| Date: 2021-08-03 |
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Abstract

This submission proposes resolutions of comments received from TGbe comment collection 36 (TGbe Draft 1.0).

* CIDs: 6715, 6716, 7890 (3 CIDs)

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Editorial improvements based on feedback from Abhi.
* Rev 2, 3: Modified the figure and text related to the example to clarify the behavior of the Proxy ARP service when the target IP address matches the IP address of an associated non-MLD STA. Made changes based on feedbacks from Mike and John. Text changes shown in CYAN.
* Rev 3: Made changes based on feedbacks from Abhi to cover the case when the ARP Request or Neighbor Solicitation message is handled by an AP affiliated with an AP MLD. Text changes shown in GREEN.
* Rev 4: Additional editorial changes based on feedback from Shawn. Text changes shown in GREEN.
* Rev 5: Further changes based on comments/discussions during 9 Sept MAC call and offline feedback. Text changes shown in GRAY.
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 |
| 6715 | Rojan Chitrakar | 11.21.14 |  |  | When an AP MLD implements the Proxy ARP Service, it is not clear which MAC Address (MLD or STA) of an associated non-AP MLD is inserted by the AP MLD as the Sender's MAC Address in the ARP response packet sent in response to an ARP request or an ARP probe carrying a matching IPv4 address being resolved. | Clarify which MAC Address (MLD or STA) of an associated non-AP MLD is inserted by the AP MLD as the Sender's MAC Address in the ARP response packet sent in response to an ARP request or an ARP probe carrying a matching IPv4 address being resolved. | **Revised.**Proxy ARP Service is updated for AP MLD. It is clarified that an AP MLD inserts an associated non-AP MLD’s MLD MAC Address as the Sender's MAC Address in the ARP response packet sent in response to an ARP request carrying a matching IPv4 address being resolved.TGbe editor to make the changes shown in IEEE 802.11-21/1275r5 under all headings that include CID 6715. |
| 6716 | Rojan Chitrakar | 11.21.14 |  |  | When an AP MLD implements the Proxy ARP Service, it is not clear which MAC Address (MLD or STA) of an associated non-AP MLD is inserted by the AP MLD in the Target Link-layer Address field of the Neighbor Advertisement message sent in response to a Neighbor Solicitation message carrying a matching IPv6 address being resolved. | Clarify which MAC Address (MLD or STA) of an associated non-AP MLD is inserted by the AP MLD in the Target Link-layer Address field of the Neighbor Advertisement message sent in response to a Neighbor Solicitation message carrying a matching IPv6 address being resolved. | **Revised.**Proxy ARP Service is updated for AP MLD. It is clarified that an AP MLD inserts an associated non-AP MLD’s MLD MAC Address in the Neighbor Advertisement message sent in response to a Neighbor Solicitation message carrying a matching IPv6 address being resolved.TGbe editor to make the changes shown in IEEE 802.11-21/1275r5 under all headings that include CID 6716. |
| 7890 | Yongho Seok | 11.21.14 | 206 | 34 | Proxy ARP service should be updated for the MLO. | As in the comment. | **Revised.**Proxy ARP Service is updated for AP MLD. It is clarified that an AP MLD inserts an associated non-AP MLD’s MLD MAC Address in the ARP response packet sent in response to an ARP request carrying a matching IPv4 address or in the Neighbor Advertisement message sent in response to a Neighbor Solicitation message carrying a matching IPv6 address.TGbe editor to make the changes shown in IEEE 802.11-21/1275r5 under all headings that include CID 7890. |

**Discussion:**

The Proxy ARP service for AP MLDs is discussed in 21/0228r3. In summary, it is proposed that an AP MLD implements the Proxy ARP service at the MLD level and if an AP MLD supports Proxy ARP service, upon receiving an ARP Request or a Neighbor Solicitation message carrying a target IP address that corresponds to an associated non-AP MLD, the AP MLD shall respond on behalf of the non-AP MLD with an ARP Response or a Neighbor Advertisement message carrying the MLD MAC Address of the non-AP MLD. This is illustrated in the figure below:



SP: Do you agree to incorporate the changes provided in IEEE 802.11-21/1275r5 to the next revision of 802.11be draft for the following CIDs:

6715, 6716, 7890

***TGbe editor: Add the following new sub-clause under 35.3 (Multi-link operation):***

35.3.XX Proxy ARP service in AP MLDs (CIDs 6715, 6716, 7890)

Implementation of the proxy ARP service is optional for an AP MLD. When supported, an AP MLD implements the proxy ARP service, as defined in 11.21.14 (Proxy ARP service), at the MLD level.

All APs affiliated with an AP MLD shall have the same setting of the Proxy ARP field in the Extended Capabilities element. If an AP MLD supports Proxy ARP service, then all affiliated APs of the AP MLD shall set the Proxy ARP field to 1 in their Extended Capabilities elements.

NOTE – For an associated STA that is not affiliated with an MLD, the Proxy ARP service is provided by the AP affiliated with the AP MLD, with which the STA is associated, as defined in 11.21.14 (Proxy ARP service).

An example of the proxy ARP service provided by an AP MLD is shown in Figure 35-xx (Example of proxy ARP service provided by an AP MLD).



Figure 35-xx (Example of proxy ARP service provided by an AP MLD)

In this example, the AP MLD has two affiliated APs: AP1 operates on channel 1 in the 5 GHz band and AP2 operates on channel 2 in the 6 GHz band. The AP MLD, AP1 and AP2 are connected to the DS, which is connected to the LAN via a portal (e.g., via Ethernet interface(s)). Two non-AP MLDs, Non-AP MLD1 and Non-AP MLD2, each with two affiliated STAs operating on channel 1 and channel 2 respectively, are associated with the AP MLD. The MLD MAC Address of Non-AP MLD1 is MLD1-M, while IPv4 address MLD1-IPv4 and IPv6 address MLD1-IPv6 are assigned to Non-AP MLD1. STA5, which is a STA that is not affiliated with a non-AP MLD, is associated with AP1. The MAC Address of STA5 is STA5-M, while IPv4 address STA5-IPv4 is assigned to STA5. STA6 is a device connected to the AP-MLD via the DS. When the AP MLD receives from STA6, via the DS, an ARP request with the target IP address set as the Non-AP MLD1’s IPv4 address, MLD1-IPv4, the Proxy ARP Service in AP MLD responds to STA6 with an ARP response packet with the Sender’s MAC Address set as MLD1-M. When the AP MLD receives from STA5, on channel 1, an ARP request with the target IP address set as MLD1-IPv4, the Proxy ARP Service in AP MLD responds to STA5 with an ARP response packet with the Sender’s MAC Address set as MLD1-M. When the AP MLD receives from Non-AP MLD2, on channel 2, a Neighbor Solicitation message with the target IP address set as the Non-AP MLD1’s IPv6 address, MLD1-IPv6, the Proxy ARP Service in AP MLD responds to Non-AP MLD2 with a Neighbor Advertisement message with the Target link layer address set as MLD1-M. It is not shown in the figure, but when an ARP Request is received by AP1 from STA3 affiliated with Non-AP MLD2, on channel 1, with the target IP address set as STA5’s IPv4 address, STA5-IPv4, the Proxy ARP Service in AP1 responds to STA3 with an ARP response packet with the Sender’s MAC Address set as STA5-M. However, if the ARP Request with the target IP address set as STA5’s IPv4 address is received by AP2 from STA4 affiliated with Non-AP MLD2, on channel 2, the ARP request is forwarded to AP1 (e.g, via the DS) and the Proxy ARP Service in AP1 responds to STA4 (e.g. via the DS and AP2) with an ARP response packet with the Sender’s MAC Address set as STA5-M.

11.21.14 Proxy ARP service (CIDs 6715, 6716, 7890)

***TGbe editor: Modify the sub-clause as the following (Track Changes ON):***

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 station, and shall update the mapping when the Internet Address of the associated station changes. When the IPv4 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 respond on behalf of the STA to an ARP request or an ARP probe (IETF RFC 5227). When an AP MLD supports Proxy ARP (see 35.3.XX (Proxy ARP service in AP MLDs)), the AP MLD shall maintain an MLD MAC Address to Internet Address mapping for each associated non-AP MLD, and shall update the mapping when the Internet Address of the associated non-AP MLD changes. 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 respond on behalf of the non-AP MLD to an ARP request or an ARP probe (IETF RFC 5227).

When an AP receives an ARP request from one associated STA or from the DS with a target IP 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 affiliated with an AP MLD receives an 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 IP 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 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 IP address that corresponds to a second associated non-AP MLD, the AP MLD shall insert the MLD MAC address of the second non-AP MLD as the Sender’s MAC Address in the ARP response packet.

When an IPv6 address is being resolved, the Proxy ARP service shall respond with a Neighbor Advertisement message (Section 4.4, IETF RFC 4861) on behalf of an associated STA or an associated non-AP MLD to an Internet Control Message Protocol version 6 (ICMPv6) Neighbor Solicitation message (Section 4.3, IETF RFC 4861). When MAC address mappings change, the AP or the AP MLD may send unsolicited Neighbor Advertisement Messages on behalf of a STA or a non-AP MLD respectively.

NOTE—The Neighbor Solicitation message is used for both address discovery and duplicate address detection (IETF RFC 4862).

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

References

[1] IETF RFC 826: <https://datatracker.ietf.org/doc/html/rfc826>

[2] IETF RFC 4861: <https://datatracker.ietf.org/doc/html/rfc4861>