IEEE P802.11
Wireless LANs

|  |
| --- |
| D5.0 CR for Max Setup Link CIDs  |
| Date: 2024-03-09 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Binita Gupta | Cisco Systems |  |  | binitag@cisco.com |
| Brian Hart | Cisco Systems |  |  | brianh@cisco.com |

 Abstract

This submission proposes resolutions for following CIDs received in TGbe SA Ballot on 802.11be D5.0:

22038, 22248, 22249

**Revisions:**

* Rev 0: Initial version of the document.
* Rev 1: Added a Discussion section. Updated “shall” requirements for setting the new status code to “should” per offline discussions to try to reach consensus.

***TGbe editor: The baseline for this document is 11be D5.01.***

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. This introduction is 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 802.11 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.***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Clause** | **Page** | **Comment** | **Proposed Change** | **Resolution** |
| 22038 | Binita Gupta | 35.3.5.4 | 517.64 | An AP may have a policy where it could limit association on a subset of links if it supports high number of links (e.g. >3 links). Adding a status code to indicate a failure reason where max number of setup links limit is reached can be helpful for clients to avoid unnecessary retries. | Add a new status code to indicate failure reason when max number of setup links limit is reached for ML setup. This also applies to ML reconfig add link operation. | RevisedAgree with the commenter. A new REJECTED\_MAX\_SETUP\_LINKS\_LIMIT\_REACHED status code is proposed and related text is added for ML (re)setup and ML Reconfiguration add link operation.TGbe editor, please make the changes tagged by CID #22038 in 11-24/0354r1. |
| 22248 | Robert Stacey | 35.3.6.1 | 520.19 | Submitted on behalf of Po-Kai. There has been discussion on some limits of maximum setup links to be 3 when an AP MLD advertises more than 3 links. If AP MLD has this limitation, then some mechanims in the spec to accommodate the interop is required. At a minimum, we have to introduce a status code to let the client know when AP MLD has this constraints. We also have to limit the status code to be used only when the condition is indeed met. | Add the status code "REJECTED\_MAX\_SETUP\_LINKS\_LIMIT\_REACHED". Add the following sentences. "The AP MLD may not accept an add link request which results in number of setup links becoming greater than 3, after the number of setup links is updated to reflect delete link operation(s) (if any) in the Link Reconfiguration Request frame and in this case, the appropriate Status Code in the Link Reconfiguration Response frame to reject an add link request is REJECTED\_MAX\_SETUP\_LINKS\_LIMIT\_REACHED." Add the following sentences "The AP MLD may reject an add link operation received in the Link Reconfiguration Request frame if the number of existing setup link(s) that are not requested to be deleted, plus the number of setup link(s) that are requested to be deleted, plus the number of setup link(s) that are requested to be added is greater than 3." Add the following sentences, "Except the scenarios discussed above, an AP MLD shall not use REJECTED\_MAX\_SETUP\_LINKS\_LIMIT\_REACHED status code to reject an add link request in the Link Reconfiguration Response frame ." | RevisedAgree with the commenter. A new REJECTED\_MAX\_SETUP\_LINKS\_LIMIT\_REACHED status code is proposed and related text is added for ML (re)setup and ML Reconfiguration add link operation.TGbe editor, please make the changes tagged by CID #22038 in 11-24/0354r1. |
| 22249 | Robert Stacey | 35.3.5.1 | 515.23 | Submitted on behalf of Po-Kai. There has been discussion on some limits of maximum setup links to be 3 when an AP MLD advertises more than 3 links. If AP MLD has this limitation, then some mechanims in the spec to accommodate the interop is required. At a minimum, we have to introduce a status code to let the client know when AP MLD has this constraints. We also have to limit the status code to be used only when the condition is indeed met. | Suggest to add the following "“If AP MLD advertise larger than or equal to 3 links, then the AP MLD shall support setup of at least 3 links.”" Alternatively, add the following explicit normative texts. “If AP MLD advertise less than or equal to 3 links, then the AP MLD shall not use the REJECTED\_MAX\_SETUP\_LINKS\_LIMIT\_REACHED status code to reject any requested link. If AP MLD advertise larger than 3 links, then the AP MLD shall not use the REJECTED\_MAX\_SETUP\_LINKS\_LIMIT\_REACHED status code to reject any requested link if the total number of requested links is less than or equal to 3. If AP MLD advertise larger than 3 links and the number of requested links is larger than 3, then the AP MLD shall not use the REJECTED\_MAX\_SETUP\_LINKS\_LIMIT\_REACHED status code to reject any requested link if the total number of accepted links after using the REJECTED\_MAX\_SETUP\_LINKS\_LIMIT\_REACHED status code on a request link is less than 3. NOTE- The above rules implies that AP MLD supports setup of at least 3 links.”Add the status code "REJECTED\_MAX\_SETUP\_LINKS\_LIMIT\_REACHED". Add the following "The AP MLD may not accept number of requested links for the ML (re)setup greater than 3 and in this case, the appropriate Status Code in the STA Profile subfield of the Per-STA Profile subelement in a (Re)Association Response frame transmitted by an AP MLD to reject an requested link is REJECTED\_MAX\_SETUP\_LINKS\_LIMIT\_REACHED. " | RevisedAgree with the commenter. A new REJECTED\_MAX\_SETUP\_LINKS\_LIMIT\_REACHED status code is proposed and related text is added for ML (re)setup and ML Reconfiguration add link operation.TGbe editor, please make the changes tagged by CID #22038 in 11-24/0354r1. |

Discussion:

For better management of its resources, an AP MLD that supports high number of links (e.g. >=4 links) might have a policy to limit the maximum number of setup links for a non-AP MLD. In this case, when the limit is reached, the AP MLD should provide an appropriate status code to the non-AP MLD indicating the failure reason (maximum setup links limit has reached). This is useful and needed so that clients do not keep retrying to reassociate with that link or keep trying to add that link. Note that if the AP MLD sends a generic status code in such a case e.g. “REFUSED\_REASON\_UNSPECIFIED”, then client may keep retrying either in short term or long term, either of which is not desirable because the request will fail based on the policy at the AP MLD, and this adds unnecessary overhead. In some cases, a client may end up reassociating to another AP MLD because it does not understand why association or add link keeps failing on certain links with the current AP MLD, and this is also not desirable. Hence, sending a specific status code indicating that the max setup links limit has reached is useful - it provides visibility of the failure condition to the client, and client then has the flexibility to support behavior to avoid unnecessary retries. Note that we don’t specify any client behavior for the new status code.

Based on the offline discussions with members, there is strong preference that the AP MLDs that advertise <=3 links should not apply any maximum setup links limit policy to the non-AP MLDs. Hence, the text captures use of the new status code only for the AP MLDs that have more than 3 links. Such AP MLDs can support 4 links across 3 bands - e.g. 2.4/5L/5H/6 links or 2.4/5/6/6 links. For such deployments with 4-link APs, when max setup links policy is applied, it is not at all desirable that clients do unnecessary and blind retries.

***TGbe editor: Please update text as shown in the clauses below for CID #22038.***

9.4.1.9 Status Code field

The Status Code field is used in a response Management frame to indicate the status of a requested

operation. The Status Code field is shown in Figure 9-137 (Status Code field format). The values of the

Status Code field are defined in Table 9-78 (Status codes).

**Table 9-78—Status codes *(continued)***

|  |  |  |
| --- | --- | --- |
| **Status code** | **Name** | **Meaning** |
| <ANA> | REJECTED\_MAX\_ALLOWED\_SETUP\_LINKS\_LIMIT\_REACHED | Link request during ML (re)setup or add link operation is rejected for a link for a non-AP MLD because the maximum number of allowed setup links limit is reached at the AP MLD for that non-AP MLD, and the limit will exceed if the link is accepted. |

**﻿35.3.5.1 ML (re)setup procedure**

**…**

**﻿**If the link on which the (Re)Association Request frame was received cannot be accepted by the AP MLD,

the AP MLD shall treat the ML (re)setup as a failure and shall not accept any requested links. If the link on

which the (Re)Association Request frame was received is accepted by the AP MLD, the ML (re)setup is

successful.

NOTE 7—The status code per link (see 9.4.1.9 (Status Code field)) can provide guidance for subsequent remediation steps if required.

NOTE 8—See 35.3.5.4 (Basic Multi-Link element usage in the context of ML (Re)Setup, Authentication, and FT Action frame exchanges between two MLDs) for the setting of the Status Code field.

The AP MLD may not accept number of requested links for the ML (re)setup greater than 3 because the maximum number of allowed setup links limit has reached. In this case, the AP MLD should set the Status Code field in the STA Profile subfield of the Per-STA Profile subelement in a (Re)Association Response frame to REJECTED\_MAX\_ALLOWED\_SETUP\_LINKS\_LIMIT\_REACHED.

If the AP MLD advertises less than or equal to 3 links, then the AP MLD shall not use the REJECTED\_MAX\_ALLOWED\_SETUP\_LINKS\_LIMIT\_REACHED status code to reject any requested link. If the AP MLD advertises more than 3 links, then the AP MLD shall not use the REJECTED\_MAX\_ALLOWED\_SETUP\_LINKS\_LIMIT\_REACHED status code to reject any requested link if the total number of requested links is less than or equal to 3. If the AP MLD advertises more than 3 links and the number of requested links is more than 3, then the AP MLD shall not use the REJECTED\_MAX\_ALLOWED\_SETUP\_LINKS\_LIMIT\_REACHED status code to reject any requested link if the total number of accepted links is less than 3.

**35.3.6 ML reconfiguration**

﻿**35.3.6.4 ML reconfiguration to the ML setup**

...

﻿If the AP MLD rejects an add link request for a Link ID, it shall set the corresponding Status subfield in the

Reconfiguration Status Duple subfield to indicate an appropriate rejection status code as per Table 9-80

(Status codes).

The AP MLD may not accept an add link request resulting in number of setup links greater than 3, because the maximum number of allowed setup links limit has reached, after the number of setup links is updated to reflect any delete link operation(s) in the Link Reconfiguration Request frame. In this case, the AP MLD should set the corresponding Status subfield to REJECTED\_MAX\_ALLOWED\_SETUP\_LINKS\_LIMIT\_REACHED in the Link Reconfiguration Response frame to reject that add link request.

The AP MLD may reject an add link operation received in the Link Reconfiguration Request frame if the number of existing setup link(s) that are not requested to be deleted, plus the number of setup link(s) that are requested to be deleted, plus the number of setup link(s) that are requested to be added is greater than 3. In this case, the AP MLD may set the corresponding Status subfield to REJECTED\_MAX\_ALLOWED\_SETUP\_LINKS\_LIMIT\_REACHED in the Link Reconfiguration Response frame to reject that add link request.

Except for the scenarios described above, an AP MLD shall not use the REJECTED\_MAX\_ALLOWED\_SETUP\_LINKS\_LIMIT\_REACHED status code in the Link Reconfiguration Response frame to reject an add link request.

…