IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Comment resolution | Multi-Link Association terminology** | | | | |
| **Date: 2021-12-09** | | | | |
| **Author(s):** | | | | |
| **Name** | **Affiliation** | **Address** | **Phone** | **email** |
| Payam Torab | Meta Platforms (formerly Facebook) | 1 Hacker Way  Menlo Park, CA 95034 |  | [torab@ieee.org](mailto:torab@ieee.org) |
| Chunyu Hu |  | [chunyuhu07@gmail.com](mailto:chunyuhu07@gmail.com) |
|  |  |  |
|  |  |  |
| Ming Gan | Huawei |  |  | [ming.gan@huawei.com](mailto:ming.gan@huawei.com) |
| Yunbo Li |  |  | [liyunbo@huawei.com](mailto:liyunbo@huawei.com) |
| Michael Montemurro |  |  | [michael.montemurro@huawei.com](mailto:michael.montemurro@huawei.com) |
| Jarkko Kneckt | Apple |  |  | [jkneckt@apple.com](mailto:jkneckt@apple.com) |
| Joseph Levy | InterDigital |  |  | [joseph.levy@interdigital.com](mailto:joseph.levy@interdigital.com) |
| Gaurav Patwardhan | HPE |  |  | [gaurav.patwardhan@hpe.com](mailto:gaurav.patwardhan@hpe.com) |

Abstract

Discussing direction for resolution to CIDs 6588, 6589 and 4569, 6587, 6641 and 6728 from CC36 (and older CIDs 1857 and 2513 from CC34).

# Revision History

|  |  |  |
| --- | --- | --- |
| **Date** | **Revision** | **Changes** |
| 2021-10-07 | 0 | Initial draft |
| 2021-12-09 | 1 | Separated straw polls |
| 2021-12-09 | 2 | Affiliation corrections |
| 2021-12-13 | 3 | New co-authors |

# CC36 Comments and discussion [against Draft 1.0]

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **P.L** | **Clause** | **Comment** | **Proposed Change** | **Proposed Resolution** |
| 6589 |  |  | Change Multi-link (re)setup procedure name to Multi-link (re)association; there is no confusion, and the procedure is simply using a (Re)Association Request/Response exchange. |  |  |
| 6270 | 254.50 | 35.3.5.1 | Setup is not correct terminology | Please change "multi-link setup" to "multi-link association" |  |
| 6588 |  |  | Find a better word for "setup link(s)" e.g., established links. | Use “established links” or similar. |  |

**Discussion #1 Multi-link setup/resetup:**

The 11be draft is using the term “multi-link setup” for the procedure that makes a non-AP MLD to AP MLD mapping known to DS. The “setup” procedure involves exchanging Association Request and Association Response frames between the non-AP MLD and an AP MLD and link selection by MLDs.

The term “multi-link resetup” is being used for the procedure that makes a non-AP MLD to AP MLD mapping known to DS upon the non-AP MLD transition from one BSS to another; the “resetup” procedure involves exchanging Reassociation Request and Reassociation response frames between non-AP MLD and AP MLD and link selection by MLDs.

We find the term unnecessary: Any procedure that involves exchange of Association Request and Association Response frames in order to make a mapping known to DS should be viewed a kind of association procedure – in this case, a “multi-link” association procedure. We find the name “multi-link association” accurate and sufficient for the procedure.

A sample text change resulting from calling the procedure association is shown below, which clearly reads better:

Before a non-AP MLD performs multi-link (re)setup with an AP MLD, the non-AP MLD and AP MLD shall follow MLD authentication procedure as described in 11.3 (STA authentication and association).

====>

Before a non-AP MLD (re)associates with an AP MLD, the non-AP MLD and AP MLD shall follow MLD authentication procedure as described in 11.3 (STA authentication and association).

We heard one concern that “multi-link association” as a procedure can be confused with the state, e.g., when the following sentence from Draft 1.1,

When association is not for a multi-link setup, BSS max idle period management enables an AP to indicate a time period during which the AP does not disassociate a STA due to nonreceipt of frames from the STA …

is written as

When association is not a multi-link association, BSS max idle period management enables an AP to indicate a time period during which the AP does not disassociate a STA due to nonreceipt of frames from the STA …

The term “multi-link association” in the new sentence does not refer to the procedure but the type of association relationship. We don’t find this confusing, and in fact find it consistent with different usages of the word (procedure and relationship) in baseline, which means the coined terms “STA association” and “MLD association”, defined below, are unnecessary

Association between two STAs is called STA association. Association between a non-AP MLD and an AP MLD is called MLD association.

In most places in the text the type of association is clear from the context; when the type is not clear, descriptive phrases such as “when association is (or is not) multi-link association …” seem sufficient; shorter phrases “STA level association” and “MLD level association” can also be used.

Another term used in the current draft is “setup link”, referring to one of possibly multiple links established at association time, as in

For MLO, the Key Data field shall include the MAC Address KDE set to the MLD MAC address of the Authenticator. When the Authenticator is an AP MLD and the Supplicant is a non-AP MLD, this field shall include one MLO GTK for each setup link (see 35.3.5).

We observe that,

* Using “setup” as an adjective is not correct English; acceptable usage could be “link that has been set up”, or “link set up”.
* The term is redundant when used in a sentence such as “links set up to a non-AP MLD” or “links set up between MLDs”, because specifying the link endpoints already implies the link existence (i.e., the fact that it has been set up). For example,

The R1KH shall derive and distribute the GTK and IGTK to all connected STAs. If the R1KH identifies an AP MLD, the R1KH shall distribute the GTKs and IGTKs ~~for setup~~ of all links to all connected non-AP MLDs.

The following table (Table 1) summarizes the proposed terminology and examples of resulting text changes.

**Table 1 – Proposed multi-link terminology**

|  |  |  |
| --- | --- | --- |
| **Draft 1.1 term** | **Proposed term** | **Examples of text change (Draft 1.1)** |
| “**multi-link setup**”  (when referring to the procedure) | **“multi-link association”**, or,  **“multi-link association procedure”** if there is need to emphasize the procedure (the same as how “association procedure” is used in baseline) | P292L40  *The Link ID subfield of the STA Control field of the Per-STA Profile subelement for the corresponding non-AP STA that requests a link for multi-link ~~setup~~ association with the AP MLD is set to the link ID of an AP MLD that is operating on that link. The link ID is obtained during discovery.*  P45L59  *The main MAC features in an EHT STA that are not present in HE STA or VHT STA or HT STA are the following:*  *—Mandatory support for GCMP-256*  *—In an MLD, mandatory support for multi-link discovery procedure*  *—In an MLD, mandatory support for multi-link ~~(re)setup~~ (re)association procedure* |
| **“has multi-link setup with ...”**  (less common poor wording meaning associated at MLD-level) | **“associated with”**  (context is clear because of the MLD references) | P300L30  *A non-AP MLD shall maintain a record of the most recently received BSS Parameters Change Count subfield value for each AP ~~in~~ affiliated with the AP MLD ~~with which it has multi-link setup~~ it is associated with.* |
| **“STA association”**  **“MLD association”**  (technical terms formally defined in the draft: “Association between two STAs is called STA association. Association between a non-AP MLD and an AP MLD is called MLD association.”) | **“association”** wherever the context is clear – this seems to be almost always (if not always) the case.  If contrast needs to be made between STA and MLD associations (uncommon), use descriptive language (preferred),  **“association between two STAs”**  **“association between two MLDs”**  or (not preferred) short qualifiers (i.e., without formal definition)  **“STA level association”**  **“MLD level association”** | P49L27 (Note: Even in these cases the term “association” by itself is clear; this is a suggestion to accommodate different preferences)  *The reassociation service (see 11.3.6 (Association, reassociation, and disassociation)) is invoked to “move”:*  *—a current ~~STA~~ association (see 4.5.3.3 (Association)) of a non-AP STA from one AP to the same AP or another AP.*  *—or a current ~~MLD~~ association (see 4.5.3.3 (Association)) of a non-AP MLD from one AP MLD to the same AP MLD or another AP MLD*  *—or a current (STA level) association of a non-AP STA with an AP to an (MLD level) association of a non-AP MLD with an AP MLD, where the MAC address of the non-AP STA is the same as the MLD MAC address of the non-AP MLD*  *—or a current (MLD level) association of a non-AP MLD with an AP MLD to a (STA level) association of a non-AP STA with an AP, where the MLD MAC address of the non-AP MLD is the same as the MAC address of the non-AP STA.* |
| **“setup link”** | **“link”** wherever the context is clear – this is almost always the case (the sentence does not make any sense if the link has not been set up).  In some cases, descriptive language such as  **“the link that has been set up …”**, or the shorter (and grammatically correct)  **“the link set up”** | Examples where link having been set up is obvious (e.g., the sentence is about something that is only possible after association),  P205L53,  *If a STA is affiliated with a non-AP MLD, the non-AP MLD shall have the same U-APSD Flag value for each AC across all ~~setup~~ links (see 35.3.5).*  P293L38  *A ~~setup~~ link is defined as enabled if at least one TID is mapped to that link and is defined as disabled if no TIDs are mapped to that link. At any point in time, a TID shall always be mapped to at least one ~~setup~~ link, unless admission control is used. By default, as TIDs are mapped to all ~~setup~~ links, all ~~setup~~ links shall be enabled (see 35.3.6.1.2 (Default mapping mode)).*  P261L10 (sentence saying  *—If beacon protection is enabled, the R1KH shall derive and distribute the BIGTK and BIPN to all connected STAs. If an R1KH identifies an AP MLD, the R1KH shall derive and distribute the BIGTKs and BIPNs for all ~~setup~~ links to all connected non-AP MLDs.*  P261L10 (style, arguable – but grammatically correct),  *The TID-to-link mapping mechanism allows an AP MLD and a non-AP MLD that performed multi-link ~~setup~~ association to determine how TIDs are mapped to the ~~setup~~ links set up in DL and in UL.* |

**Straw Poll #1**

**Do you agree with changing “multi-link setup” (the procedure) to “multi-link association”? Similarly, “multi-link resetup” (the procedure) to “multi-link reassociation”.**

*Note 1: Intention of this straw poll is to bring a text contribution that implements the above changes (through a combination of actual text and instructions to the editor).*

*Note 2: For example, “After a successful multi-link ~~(re)setup~~ (re)association between a non-AP MLD and an AP MLD, a PMKSA and PTKSA are established between the non-AP MLD and the AP MLD (see Clause 12 (Security)).”*

***Yes:***

***No:***

***Abstain:***

***No answer:***

**Straw Poll #2**

**What is your preference for the term “setup link” used throughout the text?**

*Example: “A setup link is defined as enabled if at least one TID is mapped to that link and is defined as disabled if no TIDs are mapped to that link. At any point in time, a TID shall always be mapped to at least one setup link, unless admission control is used. By default, as TIDs are mapped to all setup links, all setup links shall be enabled (see 35.3.6.1.2 (Default mapping mode)).*

1. **No change needed**
2. **“setup” is redundant in most cases; authors may use “a link that has been set up” or a “link set up” where emphasis on set up is desired**
3. **New term is needed, e.g., “established link”, “signaled link”, “negotiated link”**
4. **Something else**