SUMMARY

[0005] In one aspect, the present disclosure provides a non-Access Point (non-AP) ~~One non-limiting and exemplary embodiment facilitates providing a first station (STA) included in a first plurality of STAs affiliated with a first~~ Multi-link Device (MLD)~~, the first STA~~ comprising: circuitry, which in operation, generates ~~a request~~an Association Request frame~~, the request frame comprising request information~~ that indicates requested links and link specific information of the requested links; and a transmitter, which in operation, transmits the ~~request~~Association Request frame to ~~a second STA~~ an Access Point (AP) MLD to request a multi-link setup~~, wherein the second STA is included in a second plurality of STAs affiliated with a second MLD, and wherein the multi-link setup establishes one or more links~~ between ~~one or more STAs of the first plurality of STAs~~ the non-AP MLD and ~~corresponding one or more STAs of the second plurality of STAs~~the AP MLD ~~based on the request information~~.

[0006] ~~Another non-limiting and exemplary embodiment facilitates providing~~In one example, a second STA is included in a second plurality of STAs affiliated with a second Multi-link Device (MLD), the second STA comprising: a receiver, which in operation, receives a request frame from a first STA, wherein the first STA is included in a first plurality of STAs affiliated with a first MLD, and wherein the request frame comprises request information and is requesting for a multi-link setup that establishes one or more links between one or more STAs of the first plurality of STAs and corresponding one or more STAs of the second plurality of STAs based on the request information; and a transmitter, which in operation, transmits a response frame to the first STA to inform the result of the multi-link setup, wherein the response frame carries information of the one or more links that have been established

between the one or more STAs of the first plurality of STAs and the corresponding one or more STAs of the second plurality of STAs.

[0007] ~~Another non-limiting and exemplary embodiment facilitates providing~~In another aspect, the present disclosure includes a communication method for a non-Access Point (non-AP) Multi-link Device (MLD), a communication method comprising: generating ~~a request~~an Association Request frame that indicates requested links and link specific information of the requested links~~at a first STA included in a first plurality of STAs affiliated with a first MLD, the request frame comprising request information~~; and transmitting the ~~request~~Association Request frame to ~~a second STA~~an Access Point (AP) MLD to request a multi-link setup between the non-AP MLD and the AP MLD.~~, wherein the second STA is included in a second plurality of STAs affiliated with a second MLD, and wherein the multi-link setup establishes one or more links between one or more STAs of the first plurality of STAs and corresponding one or more STAs of the second plurality of STAs based on the request information.~~

[0008] It should be noted that general or specific embodiments may be implemented as a system, a method, an integrated circuit, a computer program, a storage medium, or any selective combination thereof. Additional benefits and advantages of the disclosed embodiments will become apparent from the specification and drawings. The benefits and/or advantages may be individually obtained by the various embodiments and features of the specification and drawings, which need not all be provided in order to obtain one or more of such benefits and/or advantages.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The accompanying figures, where like reference numerals refer to identical or functionally similar elements throughout the separate views and which together with the detailed description below are incorporated in and form part of the

specification, serve to illustrate various embodiments and to explain various principles and advantages in accordance with present embodiments.

[0010] FIG. 1 illustrates a relationship between coverage frequency and range of a wireless node.

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CLAIMS

1. A ~~first station (STA) included in a first plurality of STAs affiliated with a first~~non-Access Point (non-AP) Multi-link Device (MLD)~~, the first STA~~ comprising:

circuitry, which in operation, generates ~~a request~~an Association Request frame ~~, the request frame comprising request information~~that indicates requested links and link specific information of the requested links; and

a transmitter, which in operation, transmits the ~~request~~ Association Request frame to ~~a second STA~~an Access Point (AP) MLD to request a multi-link setup~~, wherein the second STA is included in a second plurality of STAs affiliated with a second MLD, and establi~~ between ~~one or more STAs of the first plurality of STAs~~the non-AP MLD and ~~corresponding one or more STAs of the second plurality of STAs~~the AP MLD ~~based on the request information~~.

2. The ~~first STA~~non-AP MLD according to claim 1, wherein the Association Request frame includes a Multi-Link element that includes a common information field for specifying a MAC address of the non-AP MLD ~~the request information identifies the one or more STAs of the first plurality of STAs~~.

3. The ~~first STA~~non-AP MLD according to claim 1, wherein the ~~request frame further comprises information about quality of wireless channels for each~~Association Request frame includes a Multi-Link element that includes one or more link information fields, each link information field indicating one of the requested links and its link specific information ~~of the one or more links~~.

4. The ~~first STA~~non-AP MLD according to claim 1, wherein the link specific information includes operational parameters ~~first plurality of STAs is configured to collect information about quality of wireless channels for each~~ of the ~~one or more~~requested links ~~prior to transmitting the request frame, and wherein the quality of wireless channel comprises one or more of link margin, path loss, receive signal strength indication (RSSI) and receive channel power indication (RCPI)~~.

5. The ~~first STA~~non-AP MLD according to claim 1, wherein

prior to the multi-link setup,

the circuitry ~~is further configured to~~, in operation, generates an Authentication frame comprising a ~~common~~ MAC address ~~that identifies~~of the ~~first~~ non-AP MLD; and

~~wherein~~ the transmitter ~~is further configured to~~, in operation, transmits the ~~generated~~Authentication frame to the ~~second STA~~AP MLD for multi-link authentication.

6. The ~~first STA~~non-AP MLD according to claim 1, wherein ~~an STA of the first plurality of STAs is configured to transmit another request frame to an STA of the second plurality of STAs to request~~the transmitter, in operation, transmits a Reassociation Request frame for establishing a new link ~~to be established~~ between ~~a third STA of the first plurality of STAs and a fourth STA of the second plurality of STAs~~the non-AP MLD and the AP MLD, the new link being independent of the established one or more links~~, wherein no link has yet been established between the third and the fourth STA prior to transmission of the another request frame~~.

7. The ~~first STA~~non-AP MLD according to claim 1, wherein ~~the request information comprises information about traffic characteristics that is expected for each of the one or more links, the traffic characteristics being one of Traffic identifier (TID), payload size, delay bound, data rate, minimum PHY rate~~the transmitter transmits the Association Request frame on a link that the non-AP MLD desires to use as part of the multi-link setup.

8. The ~~first STA~~non-AP MLD according to claim 1, ~~wherein the request information indicates capability information and MAC addresses of only the one or more STAs of the first plurality of STAs for which links are to be set up~~comprising

a receiver, which in operation, receives an Association Response frame that indicates one or more links that are accepted by the AP MLD.

9. The ~~first STA~~non-AP MLD according to claim ~~3~~8, wherein the Association Response frame is received on a link on which the Association Request frame is transmitted ~~the request information comprises information about quality of wireless channels for a plurality of links that can be set up between the first plurality and second plurality of STAs, and wherein the quality of wireless channels are set to implicitly indicate the one or more links to be set up~~.

10. The ~~first STA~~non-AP MLD according to claim 1, wherein the ~~first MLD is a~~ non-AP MLD includes a plurality of associated stations (STAs) and the ~~second MLD is an~~ AP MLD includes a plurality of associated APs, multi-link being to be set up between the plurality of associated STAs and the plurality of associated APs over different frequency channels.

11. A communication method for a non-Access Point (non-AP) Multi-link Device (MLD), the communication method comprising:

generating ~~a request~~an Association Request frame that ~~at a first STA included in a first plurality of STAs affiliated with a first MLD, the request frame comprising request information~~indicates requested links and link specific information of the requested links; and

transmitting the ~~request~~ Association Request frame to ~~a second STA~~an Access Point (AP) MLD to request a multi-link setup between ~~one or more STAs of the first plurality of STAs~~the non-AP MLD and ~~corresponding one or more STAs of the second plurality of STAs based on the request information~~the AP MLD.

12. The communication method according to claim 11, wherein the Association Request frame includes a Multi-Link element that includes a common information field for specifying a MAC address of the non-AP MLD.

13. The communication method according to claim 11, wherein the Association Request frame includes a Multi-Link element that includes one or more link information fields, each link information field indicating one of the requested links and its link specific information.

14. The communication method according to claim 11, wherein the link specific information includes operational parameters of the requested links.

15. The communication method according to claim 11, wherein

prior to the multi-link setup,

generating an Authentication frame that comprises a MAC address of the non-AP MLD; and

transmitting the Authentication frame to the AP MLD for multi-link authentication.

16. The communication method according to claim 11, the communication method comprising:

transmitting a Reassociation Request frame for establishing a new link between the non-AP MLD and the AP MLD, the new link being independent of the established one or more links.

17. The communication method according to claim 11, wherein the Association Request frame is transmitted on a link that the non-AP MLD desires to use as part of the multi-link setup.

18. The communication method according to claim 11, the communication method comprising:

receiving an Association Response frame that indicates one or more links that are accepted by the AP MLD.

19. The communication method according to claim 17, wherein the Association Response frame is received on a link on which the Association Request frame is transmitted.

20. The communication method according to claim 11, wherein the non-AP MLD includes a plurality of associated stations (STAs) and the AP MLD includes a plurality of associated APs, multi-link being to be set up between the plurality of associated STAs and the plurality of associated APs over different frequency channels.