individually addressed robust management frames and group addressed management frames.

SUMMARY

[0004a] In a first aspect, the present disclosure provides a transmitting multi-link device (MLD) comprising: circuitry, which in operation, constructs an Additional Authentication Data (AAD) and a Nonce and encapsulates a plaintext MAC protocol data unit (MPDU), the AAD and the Nonce to generate an encapsulated MPDU, wherein the AAD includes an Address 1 (A1) field to which a recipient MLD's medium access control (MAC) address is set, an Address 2 (A2) field to which the transmitting MLD's MAC address is set, and wherein the Nonce includes an Address 2 (A2) field to which the transmitting MLD's MAC address is set; and a transmitter, which in operation, transmits the encapsulated MPDU to the recipient MLD on a first link.

[0004b] In a second aspect, the present disclosure provides a communication method for a transmitting multi-link device (MLD), the communication method comprising: constructing an Additional Authentication Data (AAD) and a Nonce; encapsulating a plaintext MAC protocol data unit (MPDU), the AAD and the Nonce to generate an encapsulated MPDU, wherein the AAD includes an Address 1 (A1) field to which a recipient MLD's medium access control (MAC) address is set, and an Address 2 (A2) field to which the transmitting MLD's MAC address is set, and wherein the Nonce includes an Address 2 (A2) field to which the transmitting MLD's MAC address is set; and transmitting the encapsulated MPDU to the recipient MLD on a first link.

[0005] One non-limiting and exemplary embodiment facilitates providing a first multi-link device (MLD) configured to operate with a first plurality of affiliated stations, comprising: circuitry, which in operation, sets up a robust security network association

(RSNA) with a second MLD that is configured to operate with a second plurality of affiliated STAs, wherein two or more links have been established between STAs of the first plurality of affiliated STAs and corresponding STAs of the second plurality of affiliated STAs, wherein the circuitry constructs an Additional Authentication Data (AAD) and a Nonce that are used for cryptographical encapsulation of a MAC protocol data unit (MPDU) to form an encapsulated MPDU, wherein the AAD includes an Address 1 (A1) field, an Address 2 (A2) field, an Address 3 (A3) field and a Sequence Control (SC) field, and the Nonce includes an A2 field, wherein the SC field of the AAD is based on a SC field of the MPDU, and a transmitter, which in operation, transmits the encapsulated MPDU to the second MLD on a first link as an initial transmission, and upon failure of the initial transmission, retransmits the encapsulated MPDU on a second link without reperforming the cryptographical encapsulation.

[0006] Another non-limiting and exemplary embodiment facilitates providing a method for retransmission of a MPDU in a multi-link communication, comprising: setting up, at a first MLD, a robust security network association (RSNA) with a second MLD that is configured to operate with a second plurality of affiliated STAs, wherein two or more links have been established between STAs of the first plurality of affiliated STAs and corresponding STAs of the second plurality of affiliated STAs; constructing

CLAIMS

1. A transmitting multi-link device (MLD) comprising:

circuitry, which in operation, constructs an Additional Authentication Data (AAD) and a Nonce and encapsulates a plaintext MAC protocol data unit (MPDU), the AAD and the Nonce to generate an encapsulated MPDU, wherein the AAD includes an Address 1 (A1) field to which a recipient MLD's medium access control (MAC) address is set, an Address 2 (A2) field to which the transmitting MLD's MAC address is set, and wherein the Nonce includes an Address 2 (A2) field to which the transmitting MLD's MAC address is set; and

a transmitter, which in operation, transmits the encapsulated MPDU to the recipient MLD on a first link.

2. The transmitting MLD according to claim 1, wherein if the transmission of the encapsulated MPDU is unsuccessful, the transmitter retransmits the MPDU on another link without encapsulating the MPDU with a new packet number (PN).

3. The transmitting MLD according to claim 1, wherein a common packet number (PN) is used for initial transmission on the first link and retransmission on another link.

4. The transmitting MLD according to claim 1, comprising a first plurality of affiliated STAs that are capable of establishing one or more links with a second plurality of affiliated STAs associated with the recipient MLD.

5. The transmitting MLD according to claim 3, wherein the settings of the A1 and A2 fields are indicated in one of a Counter Mode Cipher Block Chaining Message Authentication Code Protocol (CCMP) Header field or a Galois/Counter Mode Protocol (GCMP) Header field of the encapsulated MPDU.

6. The transmitting MLD according to claim 1, wherein a common packet number (PN) is used for transmission and retransmission on a plurality of links.

7. The transmitting MLD according to claim 1, wherein one of a Counter Mode Cipher Block Chaining Message Authentication Code Protocol (CCMP) or a Galois Counter Mode Protocol (GCMP) is used to cryptographically protect the MPDU.

8. The transmitting MLD according to claim 1, wherein the control circuity, in operation, maintains a single packet number (PN) space for a plurality of links.

9. A communication method for a transmitting multi-link device (MLD), the communication method comprising:

constructing an Additional Authentication Data (AAD) and a Nonce;

encapsulating a plaintext MAC protocol data unit (MPDU), the AAD and the Nonce to generate an encapsulated MPDU, wherein the AAD includes an Address 1 (A1) field to which a recipient MLD's medium access control (MAC) address is set, and an Address 2 (A2) field to which the transmitting MLD's MAC address is set, and wherein the Nonce includes an Address 2 (A2) field to which the transmitting MLD's MAC address is set; and

transmitting the encapsulated MPDU to the recipient MLD on a first link.

10. The communication method according to claim 9, wherein if the transmission of the encapsulated MPDU is unsuccessful, the communication method including: retransmitting the MPDU on another link without encapsulating the MPDU with a new packet number (PN).

11. The communication method according to claim 9, wherein a common packet number (PN) is used for initial transmission on the first link and retransmission on another link.

12. The communication method according to claim 9, the transmitting MLD comprising a first plurality of affiliated STAs that are capable of establishing one or more links with a second plurality of affiliated STAs associated with the recipient MLD.

13. The communication method according to claim 9, wherein the settings of the A1 and A2 fields are indicated in one of a Counter Mode Cipher Block Chaining Message Authentication Code Protocol (CCMP) Header field or a Galois Counter Mode Protocol (GCMP) Header field of the encapsulated MPDU.

14. The communication method according to claim 9, wherein a common packet number (PN) is used for transmission and retransmission on a plurality of links.

15. The communication method according to claim 9, wherein one of a Counter Mode Cipher Block Chaining Message Authentication Code Protocol (CCMP) or a

Galois Counter Mode Protocol (GCMP) is used to cryptographically protect the MPDU.

16. The communication method according to claim 9, comprising maintaining a single packet number (PN) space for a plurality of links.