Stream (ADDTS) Request/Response exchange). A Block Ack agreement for the corresponding TIDs also needs to be performed (via an Add Block Ack (ADDBA) Request/Response exchange).

SUMMARY

[0004] One non-limiting example facilitates providing a multi-link device configured to operate with a first plurality of affiliated stations, the first multi-link device comprising: circuitry, which in operation, initiates setup of a block acknowledgement agreement with a second multi-link device that is configured to operate with a second plurality of affiliated stations, wherein a link has been established between each station of the first plurality of stations and a corresponding station of the second plurality of stations; and a transmitter, which in operation, transmits frames of a Traffic Identifier (TID) on one or more links to the second multi-link device based on the block acknowledgement agreement, wherein the first plurality of stations are configured to share a common transmit buffer that stores the frames of the TID to be transmitted to the second multi-link device and a common transmit buffer control to manage the transmission of the frames over the one or more links, and wherein each of the first plurality of stations is configured to maintain a per-link transmit buffer control to manage the transmission of the frames on a corresponding one of the one or more links.

[0004a] In one aspect, the present disclosure refers to an originator multi-link device (MLD) comprising, circuitry, which in operation, establishes a multi-link Block Ack agreement for a plurality of links with a recipient MLD, wherein the circuitry, in operation, maintains a single common transmit buffer control to feed a plurality of MAC layer Protocol Data Units (MPDUs) with a common Traffic Identifier (TID) for

transmission across the one or more links, a transmitter which, in operation, transmits to the recipient MLD the plurality of MPDUs with the common TID on one or more links among the plurality of links, and a receiver which, in operation, receives one or more per-link Block Acks from the recipient MLD, each of the one or more per-link Block Acks indicating reception status of a subset of the plurality of MPDUs, the subset being transmitted on one of the one or more links.

[0005] Another non-limiting example facilitates providing a method for multi-link communication, comprising: initiating setup, at a first multi-link device, of a block acknowledgement agreement with a second multi-link device that is configured to operate with a second plurality of stations, the first multi-link device being configured to operate with a first plurality of stations, wherein a link has been

established between each station of the first plurality of stations and a corresponding station of the second plurality of stations; and transmitting frames of a Traffic Identifier (TID) on one or more links to the second multi-link device based on the block acknowledgement agreement, wherein the first plurality of stations are configured to share a common transmit buffer that stores the frames of the TID to be transmitted to the second multi-link device and a common transmit buffer control to manage the transmission of the frames over the one or more links, and wherein each of the first plurality of stations is configured to maintain a per-link transmit buffer control to manage the transmission of the frames on a corresponding one of the one or more links.

[0005a] In another aspect, the present disclosure refers to a transmission method by an originator multi-link device (MLD), the transmission method comprising, establishing a multi-link Block Ack agreement for a plurality of links with a recipient MLD, maintaining a single common transmit buffer control to feed a plurality of MAC layer Protocol Data Units (MPDUs) with a common Traffic Identifier (TID) for transmission across the one or more links, transmitting to the recipient MLD the plurality of MPDUs with the common TID on one or more links among the plurality of links, and receiving one or more per-link Block Acks from the recipient MLD, each of the one or more per-link Block Acks indicating reception status of a subset of the plurality of MPDUs, the subset being transmitted on one of the one or more links.

[0006] It should be noted that general or specific examples 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 examples will become apparent from the specification and drawings. The benefits and/or advantages may be individually obtained by the various

examples 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

[0007] 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.

[0008] FIG. 1 depicts an illustration of an overview of an 802.11 wireless network basic service set (BSS) in accordance with various embodiments.

CLAIMS

1. An originator multi-link device (MLD) comprising:

circuitry, which in operation, establishes a multi-link Block Ack agreement for a plurality of links with a recipient MLD, wherein the circuitry, in operation, maintains a single common transmit buffer control to feed a plurality of MAC layer Protocol Data Units (MPDUs) with a common Traffic Identifier (TID) for transmission across the one or more links;

a transmitter which, in operation, transmits to the recipient MLD the plurality of MPDUs with the common TID on one or more links among the plurality of links; and

a receiver which, in operation, receives one or more per-link Block Acks from the recipient MLD, each of the one or more per-link Block Acks indicating reception status of a subset of the plurality of MPDUs, the subset being transmitted on one of the one or more links.

2. The originator MLD according to claim 1, wherein the multi-link Block Ack agreement is established per TID by:

transmitting an Add Block Ack (ADDBA) Request frame on an enabled link; and

receiving an Add Block Ack (ADDBA) Response frame on the enabled link.

3. The originator MLD according to claim 2, wherein the single common transmit buffer control uses WinStart and WinSize for each block acknowledgement agreement, the WinStart indicating a starting sequence number of a common transmit window for the plurality of links, and the WinSize indicating a size of a receive reordering buffer maintained by the recipient MLD.

4. The originator MLD according to claim 3, wherein the circuitry, in operation, releases a common transmit buffer associated with a successfully received MPDU upon receiving the one or more per-link Block Acks containing a reception status of the successfully received MPDU.

5. The originator MLD according to claim 1, wherein the received one or more per-link Block Acks are consolidated to a Multi-link Block Ack scoreboard to determine which of the plurality of MPDUs needs retransmission.

6. The originator MLD according to claim 5, wherein the Multi-link Block Ack scoreboard comprises a bitmap comprising a plurality of bits, each bit indicating whether a corresponding MPDU is successfully received by the recipient MLD.

7. A transmission method by an originator multi-link device (MLD), the transmission method comprising:

establishing a multi-link Block Ack agreement for a plurality of links with a recipient MLD;

maintaining a single common transmit buffer control to feed a plurality of MAC layer Protocol Data Units (MPDUs) with a common Traffic Identifier (TID) for transmission across the one or more links;

transmitting to the recipient MLD the plurality of MPDUs with the common TID on one or more links among the plurality of links; and

receiving one or more per-link Block Acks from the recipient MLD, each of the

one or more per-link Block Acks indicating reception status of a subset of the plurality of MPDUs, the subset being transmitted on one of the one or more links.

8. The transmission method according to claim 7, wherein the multi-link Block Ack agreement is established per TID by:

transmitting an Add Block Ack (ADDBA) Request frame on an enabled link; and

receiving an Add Block Ack (ADDBA) Response frame on the enabled link.

9. The transmission method according to claim 8, wherein the single common transmit buffer control uses WinStart and WinSize for each Block Ack agreement, the WinStart indicating a starting sequence number of a common transmit window for the plurality of links, and the WinSize indicating a size of a receive reordering buffer maintained by the recipient MLD.

10. The transmission method according to claim 9, comprising:

releasing a common transmit buffer associated with a successfully received MPDU upon receiving the one or more per-link Block Acks containing a reception status of the successfully received MPDU.

11. The transmission method according to claim 7, comprising:

consolidating the received one or more per-link Block Acks to a Multi-link Block Ack scoreboard to determine which of the plurality of MPDUs needs retransmission.

12. The transmission method according to claim 11, wherein the Multi-link Block Ack scoreboard comprises a bitmap comprising a plurality of bits, each bit indicating whether a corresponding MPDU is successfully received by the recipient MLD.